American Society of Civil Engineers.

PROCEEDINGS.

Vol. XII.—January, 1886.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

JANUARY 6TH, 1886.—The Society met at 20 o'clock, Vice-President George S. Greene, Jr., in the Chair. The ballot was canvassed upon the proposed amendment to the By-Laws, substituting in Section 24, Clause 5, the word "December" for the word "November." The clause will then read:

5th. "Any five Members, not officers of the Society, may present to the Board of Direction, on or before December 1st, a list of names proposed by them for officers, which list or lists shall also be issued for ballot."

There were in the affirmative 142 votes, and in the negative 4 votes. This amendment was declared adopted.

The following candidates were elected. As Members: Maximilian Ferdinand Bonzano, of Philadelphia, Pa.; Franklin Ide Fuller, of Portland, Oregon; George Watson Kittredge, of Zanesville, Ohio; Henry Wadsworth Reed, of Waycross, Ga.; Henry Frederic Rudloff, of Caracas, Venezuela, South America; Albert John Scherzer, Sonsonate, Salvador, Central America. As Associate: Calvin Tomkins, of New York City. As Junior: Harry Lee Van Zile, of Troy, N. Y.

The paper previously presented by Mr. JOSEPH M. WILSON, M. Am. Soc. C. E., on Specifications for Strength of Iron Bridges, was then discussed. Written discussions were presented from Messrs. William H. Burr, Mansfield Merriman, S. W. Robinson, Geo. F. Swain, G. Bouscaren, Mace Moulton, A. P. Boller, Geo. H. Pegram, William Sellers, James G. Dagron, George L. Vose, J. B. Davis and E. Thacher. The paper was also discussed by Mr. C. C. Schneider.

THE ANNUAL MEETING OF THE SOCIETY.

JANUARY 20TH, 1886.—The meeting was called to order by President Graff at 10 o'clock. Messrs. Chas. H. Swan, J. F. Flagg, Robert Cartwright and F. C. Prindle were appointed tellers to canvass the ballot for officers.

The Annual Report of the Board of Direction* was read by the Secretary, and, on motion, accepted.

The Annual Report of the Treasurer* was read by the Treasurer, and, on motion, accepted.

The Report of the Finance Committee* was read by the Secretary, and, on motion, accepted.

The Report of the Board of Censors to Award the Norman Medal was read and accepted. It is as follows:

To the American Society of Civil Engineers:

The Board of Censors to award the Norman Medal for the year terminating August 1st, 1885, report that, in their judgment, the award be made to Paper No. 300, "Record of Tests of Cement Made for the Boston Main Drainage Works, 1878–1884," by Eliot C. Clarke, M. Am. Soc. C. E.

Respectfully submitted,
G. BOUSCAREN,
ROBERT MOORE,
W. HOWARD WHITE,
Board of Censors to award the Norman Medal.

The Report of the Committee to award the Rowland Prize was read and accepted. It is as follows:

To the American Society of Civil Engineers:

The Committee appointed to award the Rowland Prize for the year terminating on the first day of August, 1885, reports that, in its judgment, the prize should be awarded to Paper No. 295, "Experiments with New Apparatus on Journal Friction at Low Velocities," by A. M. Wellington, M. Am. Soc. C. E.

Respectfully submitted,
MENDES COHEN,
EDWARD P. NORTH,
JOHN BOGART,
Committee.

* Printed separately.

The following summary of replies received in reference to the place for holding the next Convention was presented:

Denver was suggested	by	84
Burlington	"	39
San Francisco	"	4
Saratoga	"	4
New York	"	3
Cincinnati	"	2

The following places were also suggested in the replies received: Newport, Fortress Monroe, White Sulphur Springs, Montreal, Long Branch, Louisville, Washington, Chattanooga, Cleveland, Lake George, Catskill, Albany and Philadelphia.

After discussion, it was resolved to hold the Convention at Denver, or in the neighborhood of that city, and the date, and other details in reference to the Convention, were referred to the Board of Direction, with power.

The replies to the circular in reference to a suggested trip to England during the summer were presented, showing that 78 persons expressed a desire to make such a trip, should it be arranged. A communication was presented from the Director-General of the proposed American Exhibition in London, stating that such exhibition would be postponed until 1887, and extending the invitation to visit England to 1887.

On motion, the subject was laid on the table.

The Committee to confer in reference to a Plan for a Library for Joint Use presented the following report, which was, on motion, accepted, and the Committee continued.

NEW YORK, January 19th, 1886.

To the American Society of Civil Engineers:

GENTLEMEN.—At the last annual meeting you adopted the following: "*Resolved*, That the President be authorized to appoint a committee, consisting of five members, to confer with committees appointed by kindred societies for the purpose of devising and considering a plan for creating a library for the joint use of the organizations represented by the committees in conference; said plan to be reported to the Society for such action as may be desirable."

Your Committee, appointed by the President under that resolution, begs leave to report as follows:

The Committee met twice, and at its second meeting it was joined by Committees from the following societies:

The American Institute of Mining Engineers; The American Society of Mechanical Engineers; The American Institute of Electrical Engineers.

The Committees of the four societies organized on May 13th, 1885, as a Joint Committee, by electing Wm. P. Shinn, of your Committee, as Chairman, and M. N. Forney, of your Committee, as Secretary; the Joint Committee also appointed a Sub-Committee consisting of one Member from each Society, and the Chairman, to procure information.

The Joint Committee has had several meetings.

We find entire unanimity among the members of the Joint Committee, and, so far as their views have been expressed, among the Members of the several societies, as to the desirability of a joint library; and the members of the Joint Committee are practically in accord as to the general plan to be adopted.

Your Committee is encouraged with the prospect of success in securing a plan which will be at once practical and capable of execution, but is not yet prepared to report any details.

With this report of what we believe to be substantial progress, we respectfully request that the Committee be continued.

WM. P. SHINN,
HENRY R. TOWNE,
T. C. CLARKE,
G. S. MORISON,
M. N. FORNEY,
} *Committee.*

The Report of the Committee on Uniform Standard Time was presented, and, on motion, accepted, and the Committee continued.

The report is as follows:

ROOMS OF THE SOCIETY, AMERICAN SOCIETY CIVIL ENGINEERS,
NEW YORK, January 20th, 1886.

The Special Committee on Standard Time beg leave respectfully to report.

It may be remembered by Members of the Society, that a few weeks previous to the date of the last annual report, the International Meridian Conference completed its deliberations, and that the President of the United States, in his message at the opening of Congress, drew attention to their proceedings, dwelling upon the unanimity displayed in the votes of the Conference. The delegates composing it, gathered from the entire civilized world, were practically unanimous in the determination of a zero for time and longitude, and with equal unanimity, adopted for all nations a universal day, the hours of which are to be counted from zero to twenty-four.

This authoritative announcement by the President may be accepted as a marked recognition of the admitted importance of a reform in time-reckoning. It is but a few years since any systematic attempts have been made to remodel the old usages, and reach a rational system more in accord with the requirements of the present age, and it is in no small degree due to the persistent efforts which have been made by the American Society of Civil Engineers since the subject was first discussed in 1881, that its present prominence has been obtained; efforts which had only in view the common benefits, in which every locality and every country would equally participate.

The Committee do not now propose to discuss the advantages attainable by the establishment of universal or cosmic time. However much its general application would simplify all problems in which any question of time connected with railway, telegraph and ocean steam service, is

involved, it may be assumed that the busy populations of the world are as yet scarcely prepared to receive it for use in the events of every-day life. A change of this character can be introduced only slowly and gradually. It can only make its way by the force of its necessity and a proper appreciation of the advantages it would confer. There is in the minds of men a strong natural disinclination to depart from old practices, and it is the more remarkable that, notwithstanding this aversion to change, so much progress has been made in time reform within so short a period.

On this continent the standard hour system has been successfully applied. It has been in common use for more than two years, and it has been generally accepted in the United States and Canada as in every respect beneficial and advantageous. If there be localities where this common satisfaction is not experienced, it is at those centers of population which, by their geographical position, come midway between the hour meridians. At such points the notation of time is not confined to one series of numbers. Railway trains arrive and depart by more than one hour standard. There is, under such circumstances, a non-accord of time in the same city, and the old time difficulty, so happily removed from so many other localities on every part of the continent, continues to be experienced.

There is but one remedy for every difficulty of this kind, viz., the adoption of one uniform reckoning in all longitudes, and such would be the effect of universal time alluded to by the President in his annual message. And until we reach the common acceptance of this principle of notation, the inconveniences still remaining in certain centers are obviously unavoidable, and in such localities the evils must continue until cosmic time comes into common use.

We are now but fourteen or fifteen years from the close of the nineteenth century. Scientific men may recollect that the Russian astronomer, Struve, recommended that the change in the Nautical Almanac, by which the ephemerides are to be made to accord with the date-notations, according to universal time, should commence on the change of the century. Possibly that epoch would be equally a suitable occasion to mark the realization of the highest aspirations of the most ardent time-reformers. If so much has been acccomplished since this Society first considered the question, less than five years back, is it too much to expect that in fifteen years all the prejudices which use and habit have engendered, will be conquered, and the public mind prepared for the acceptance in every-day life of a rational scientific time-system, free from all anomalies, and securing complete uniformity in all longitudes on the earth's surface? Possibly, if the circumstances will admit the adoption at that date of cosmic time for all purposes, the change would be considered a fit inauguration of the commencement of the twentieth century.

In science, universal or cosmic time is accepted, but the immediate introduction of it in ordinary life is obviously premature. It will only be step by step that the public will be led to adapt themselves to the change. One step, it is not too soon to consider, that feature in the system alluded to by the President, the numeration of the hours in a single series from midnight to midnight.

This feature has the authority of the International Conference for its introduction. In intelligent circles in Europe, particularly in England and in Russia, also at the antipodes in Australia, the proposal is reported to have been greeted with enthusiasm. The Astronomer-Royal of England, Mr. Christie, has established at Greenwich Observatory a division of the great dial into 24 hours. In London and in other cities, public clocks have been also changed to accustom the English public to this division of the day. Some newspapers in all their announcements adopt the change, and Scientific Societies give notice of their meetings in the same manner as this Society, according to the 24-hour system.

On this Continent there has been no uncertain sound. In the last annual report of the Committee, it was stated that 171 managers of railways in the United States and Canada had declared their readiness to abandon the division of the day into half-days, known as *ante* and *post* meridian, and to accept the numeration of the hours in one series, from midnight to midnight; these managers having under their control some 60,000 miles of railway.

During the past year the seed sown has been fructifying, and many who held back have been won over and have given their adhesion to the movement. Among the many important railways ready to co-operate, some appear to see no necessity for further delay, and desire to secure at once the advantages which will result from the change. At this date it is publicly announced that the Canadian Pacific Railway Company have determined to adopt the 24-hour system, and are actually preparing to make the change at an early day. Such proceedings can be accepted as indicating a proper appreciation of the reform which the American Society of Civil Engineers has advocated, and equally shows the discernment of those who direct the management of the youngest of the transcontinental railways. This practical commencement will, without a doubt, be speedily followed by other railway companies, and before long we may hope to see the 24-hour system coming into general use.

On behalf of the Committee,

SANDFORD FLEMING,
Chairman.

The Committee to present the subject of Time Nomenclature to the General Railway Time Conventions reported progress, and, on motion, the report was accepted and the Committee continued.

The Committee to consider the subject of the Compressive Strength of Cement and the Compression of Mortars and Settlement of Masonry,

reported that the Committee had begun its labors, but had not at present a special report to make. On motion, the report was accepted and the Committee continued.

The Chairman of the Committee to consider changes in the Society's organization, reported that the Committee were unable to agree, and submitted a minority report. After discussion, the subject was referred back to the Committee.

At 13 o'clock recess was taken until 14:30 o'clock.

The session of the Annual Meeting was resumed, President Graff in the Chair. The tellers appointed to canvass the ballot for officers of the Society, reported as follows:

Report of the Tellers appointed to Canvass the Ballot for Officers of the Society for the ensuing year.

ANNUAL MEETING, JANUARY 20TH, 1886.

The Tellers respectfully report as follows:

Total number of ballots received.....		513
Deduct ballots received from Members not entitled to vote, being in arrears.....	16	
Deduct duplicate and triplicate ballots and ballots not indorsed	23	
	—	39
Total number found correct and counted.....		474

For *President:* Henry Flad has received 321 votes: Washington A. Roebling has received 148; William H. Paine has received 1; Fred. Graff has received 1. For *Vice-Presidents:* T. F. Rowland has received 467; T. C. Keefer has received 329; Charles H. Latrobe has received 147; J. B. Eads has received 1; C. Shaler Smith has received 1; C. B. Comstock has received 1; A. M. Wellington has received 1. For *Secretary and Librarian:* John Bogart has received 472; J. J. R. Croes has received 1. For *Treasurer:* J. J. R. Croes has received 472; John Bogart has received 1. For *Directors:* O. W. Barnes has received 144; George S. Greene, Jr., has received 469; William R. Hutton has received 467; W. Howard White has received 328; Wm. G. Hamilton has received 145; O. E. Michaelis has received 142; Henry G. Morris has received 332; Charles L. Strobel has received 324; Geo. S. Morison has received 1; Wm. E. Worthen has received 1: De Volson Wood has received 1; D. J. Whittemore has received 1; A. M. Wellington has received 1; Q. A. Gillmore has received 1; E. P. North has received 1; M. N. Forney has received 1; J. H. Shedd has received 1; A. P. Boller has received 1; Charles Macdonald has received 1; W. S. Rosecrans has received 1; W. Sooy Smith has received 1; Theodore Cooper has received 1.

The following persons have received a majority of votes, there being an excess over 237:

For President: Henry Flad, 321. For Vice-Presidents: Thomas C. Keefer, 329; Thomas F. Rowland, 467. For Secretary and Librarian: John Bogart, 472. For Treasurer: J. James R. Croes, 472. For Directors: Geo. S. Greene, Jr., 469; Wm. R. Hutton, 467; W. Howard White, 328; Henry G. Morris, 332; Chas. L. Strobel, 324.

Respectfully submitted,

CHARLES H. SWAN,
ROB'T CARTWRIGHT,
J. F. FLAGG,
F. C. PRINDLE.

The following Members were thereupon declared elected Officers of the Society for the ensuing year:

President: HENRY FLAD.
Vice-Presidents: THOMAS C. KEEFER, THOMAS F. ROWLAND.
Secretary and Librarian: JOHN BOGART.
Treasurer: J. JAMES R. CROES.
Directors: GEORGE S. GREENE, JR., WILLIAM R. HUTTON, W. HOWARD WHITE, HENRY G. MORRIS, CHARLES L. STROBEL.

Dr. THOMAS EGLESTON, M. Am. Soc. C. E., Member of the Committee on Standard Time, made some remarks upon the general subject of the twenty-four hour system, and upon the adaptation of clocks and watches to that notation.

Captain O. E. MICHAELIS, M. Am. Soc. C. E., presented a note in reference to the cost of concrete upon a recently executed work.

The President announced the appointment of the following Members upon the Committee to consider the Relation to Each Other of the Sections of Railway Wheels and Rails: Messrs. H. Stanley Goodwin, A. M. Wellington, Geo. S. Morison, Samuel Rea and Thomas Rodd.

On motion it was resolved that the President be authorized to add two names to this Committee at a future time.

Dr. THOMAS EGLESTON, M. Am. Soc. C. E., read a short paper on the Disintegration of the Egyptian Obelisk in the Central Park in New York.

Mr. RICHARD P. ROTHWELL, M. Am. Soc. C. E., described a new device for laying submarine tunnels.

Recess was taken until 20 o'clock.

The session of the meeting was resumed at 20 o'clock. Mr. B. S. Church, M. Am. Soc. C. E., Chief Engineer of the Croton Aqueduct Commission, described the works in progress and contemplated, for securing additional water supply for the City of New York.

JANUARY 21ST, 1886.—An excursion was made over the Hudson River Railroad to the Croton River, the site for the proposed great Dam at Quaker Bridge being first visited. The party then proceeded up the

valley of the Croton to the present Croton Dam. The tunnel for the Aqueduct and the works in progress for the Gate-house at the beginning of the Aqueduct, were examined. By invitation of Mr. Church, lunch was eaten at that point. A special train was then taken on the New York City and Northern Railroad, the route of which is, for a considerable distance, within sight of the line of the Aqueduct, and stops were made at several points. The party descended Shaft No. 17, and saw the progress of work both of the heading in rock tunnel and of the brick conduit in construction and completed. Returning to the city, a trip was made over the Tenth Avenue Cable Road, under the auspices of Colonel Wm. H. Paine, M. Am. Soc. C. E., the Chief Engineer of that road, and the machinery for the propulsion of the cables was examined at the station, One Hundred and Twenty-eighth street and Tenth avenue. The return to the Society House was made over the lines of the Elevated Railroad.

In the evening, a reception, tendered by the Resident Members to the Visiting Members and other guests, was held at the Society House.

The Members of the Society, 147 in number, present at the Annual Meeting, excursions, etc., were: Julius W. Adams, Edward R. Andrews, E. C. Appleton, John W. Bacon, Thomas N. Bailey, A. P. Barnard, O. W. Barnes, L. F. Beckwith, John A. Bensel, Henry A. Bentley, George H. Bishop, H. D. Blunden, John Bogart, Alfred P. Boller, William F. Booth, Robert E. Briggs, Fred. Brooks, Charles O. Brown, Charles B. Brush, Andrew Bryson, L. L. Buck, Frank A. Calkins, Robert Cartwright, S. H. Chittenden, B. S. Church, F. H. Clement, Mendes Cohen, Francis Collingwood, Theodore Cooper, J. James R. Croes, John Y. Culyer, Wendell R. Curtis, Charles G. Darrach, Joseph P. Davis, E. P. Dawley, P. P. Dickinson, Thomas Egleston, Charles E. Emery, S. M. Felton, Jr., John W. Ferguson, C. F. Ferrer, Clark Fisher, J. Foster Flagg, C. E. Fogg, John D. Fouquet, George B. Francis, John R. Freeman, George H. Frost, E. L. B. Gardiner, Henry Goldmark, H. Stanley Goodwin, E. Sherman Gould, Frederic Graff, Samuel M. Gray, George S. Greene, George S. Greene, Jr., Malcolm S. Greenough, Stephen S. Haight, William G. Hamilton, Charles M. Harris, Robert L. Harris, William P. Harris, William J. Haskins, Arthur Haviland, Albert B. Hill, Warren E. Hill, S. Willett Hoag, Jr., Frank W. Hodgdon, Frank H. Howes, Charles W. Hunt, William R. Hutton, George A. Just, Charles Kellogg, Joseph M. Knap, C. H. Latrobe, E. D. Leavitt, Jr., Louis Lesage, G. Leverich, Horace Loomis, Thomas D. Lovett, William W. Maclay, Charles Macdonald, William B. Mackenzie, George B. Mallory, C. C. Martin, C. S. Maurice, Thomas C. McCollom, D. E. McComb, T. H. McKenzie, George W. McNulty, Henry C. Meyer, Thomas C. Meyer, O. E. Michaelis, C. H. Myers, O. F. Nichols, Edward P. North, F. O. Norton, Ellis B. Noyes, F. S. Odell, L. F. Olney, S. B. Opdyke, Joseph O. Osgood, James Owen, A. B. Paine, William H. Paine,

W. Barclay Parsons, Jr., John A. Partridge, H. W. B. Phinney, F. C. Prindle, Chas. Ward Raymond, Samuel Rea, Percival Roberts, Jr., Thomas F. Rowland, G. M. Rusling, J. Gardner Sanderson, D. C. Sanford, C. C. Schneider, William P. Shinn, R. I. Sloan, Maxwell Smith, W. Harrison Smith, Chandler D. Starr, D. McN. Stauffer, Frank S. Stevens, Charles H. Swan, E. Sweet, Henry R. Towne, A. W. Trotter, John G. Van Horne, Edgar B. Van Winkle, Charles D. Ward, Lebbeus B. Ward, F. W. Watkins, William Watson, Albert L. Webster, A. M. Wellington, Nelson J. Welton, E. B. Weston, W. Howard White, Frank O. Whitney, William H. Wiley, F. N. Willson, Sebastian Wimmer, C. J. H. Woodbury, William E. Worthen, Preston K. Yates and A. J. Zabriskie.

REPORT OF THE BOARD OF DIRECTION FOR THE YEAR ENDING DECEMBER 31ST, 1885.

PRESENTED AND ACCEPTED AT THE ANNUAL MEETING, JANUARY 20TH, 1886.

The Board of Direction, in compliance with the provisions of the Society law, presents its report for the year ending December 31st, 1885.

MEMBERSHIP.

As shown by the tabular statement hereinafter given, there has been, during the year, an addition of 74 to the various grades of Society membership. In this nominal addition of 74 there are 3 former Juniors transferred to Members, therefore the actual new additions to the Society membership during the year number 71.

The losses from the Society membership have been 21, being 12 by death, 5 by resignation and 4 dropped. The number of persons now connected with the Society is 928, being greater by 50 than at the end of the previous year.

The actual net increase during the year, and present total in each class of membership, are:

Honorary Members,	decrease during year	2	Total.....		8
Corresponding Members,		..	"		3
Members,	increase "	44	"		701
Associates,	decrease "	1	"		33
Juniors,	increase "	12	"		89
					834
Fellows not included above,	decrease "	3	"		54
Subscribers to Building Fund, not included above.....					40
Increase during year.....		50	Total.....		928

Tables showing the classification of membership at the beginning of the year, and the changes during the year, are given at a subsequent part of this report.

THE ANNUAL CONVENTION.

The Annual Convention was held at Deer Park, Md., on the line of the Baltimore and Ohio Railroad, on June 24th, 25th and 26th of the past year. A detailed report of the Convention has been published in the Proceedings for June last. Previous to the Convention a large number

of Members of the Society met in Baltimore, and, under the escort of Members resident in that city, and of officers of the Baltimore and Ohio Railroad, visited the freight and marine terminals, the elevators and docks of that railroad, and also enjoyed an excursion upon the harbor of Baltimore and to the United States forts in the vicinity. A visit was also made, under the escort of the Chief Engineer of the Baltimore Water Department, to the water-works and the source of water supply of that city. A special train conveyed the party from Baltimore to Deer Park, stops being made to inspect the Mt. Clare shops of the road, and also at a number of points of interest on the line. On one of the days of the Convention, a part of the day was spent in a trip over the Mountain Division of the railroad.

In the last Annual Report of the Board, particular attention was called to the subject of the methods for holding future Conventions. It was suggested that some, if not all, of our Conventions should be held at such places and in such a manner as to secure the results outlined in that report, which are:

(*a.*) The presentation, consideration and undisturbed discussion of professional subjects.

(*b.*) The opportunity for free intercourse between Members of the Society gathering at our Conventions from all parts of the United States, and in fact of the world.

(*c.*) Such opportunities for social recreation as may not interfere with, but rather aid in, the other two objects mentioned above.

Of course, visits to points of engineering interest should not be neglected.

The Convention at Deer Park was very successful, giving an opportunity for carrying out the suggestions referred to, and in many respects it was particularly satisfactory, more especially in the remarkable value of the discussions, and the importance of the papers and subjects presented during its meetings.

Invitations have been presented to the Society from the citizens of Denver, Colorado, and of Burlington, Vermont, to hold the next Annual Convention at each of these places. These invitations have been announced in a general circular, the reply to which, with the suggestions of the various Members of the Society, will be presented for your consideration at this meeting.

Meetings of the Society.

The regular meetings have been well attended, the attendance having been twenty per cent. greater than during any previous year, and, as in past years, the number of Members not resident in New York who have taken part in these meetings has been large, and the number of contributions of discussions from Non-Resident Members has been very gratifying.

The collations following the meetings on the first of the month have been continued through the subscriptions of Resident Members, and have offered opportunities for conversation which probably would not otherwise have been secured. As stated in a former report of the Board, no funds of the Society are used for these collations.

Transactions.

The Transactions have been issued during the year with regularity, and the very valuable contributions by our Members and by other engineers to the Transactions are particularly acknowledged by the Board. The number of pages printed yearly is increased as rapidly as the income of the Society will warrant. During the past year 162 pages of the Transactions and Proceedings have been issued beyond the highest number ever printed in any previous year. The Board has adopted the course of devoting by far the larger part of the income of the Society to the publication of its Transactions, as will be seen by the Report of the Treasurer, in which it may also be noted that the amounts charged to postage, to salaries, and to the work of committees, are largely expended in the preparation and issue of the Transactions. The Board believes that it is proper so to devote as much as possible of our income to the publications of the Society.

The Society House and the Building Fund.

There have been but two contributions to the Building Fund during the year. Every contribution to this fund reduces materially the rental paid by the Society for its house, which rental is now paid in the form of interest upon the mortgage and of the taxes upon the property. The house itself is an excellent investment, gradually increasing in value each year, and the Board again desires to call attention to the great desirability of reducing the mortgage upon the property by contributions to the Building Fund of the Society, from persons interested in its welfare.

Fellowship Fund.

During the past year but one Fellow of the Society has been elected, and the Fellowship Fund has therefore been increased by only one subscription.

The Board desires to impress upon the Members of the Society that it is probable that the presentation of the subject of association with the Society as a Fellow, to many gentlemen not otherwise connected with it, would result in a large increase of this important Fund, the income from which is devoted to our publications. Connection with the Society as a Fellow secures all the publications of the Society and a participation in all the privileges, except the right to vote.

Advance Notices of Candidates for Membership.

The issue of notices to all Members of the Society, giving the names and addresses of Candidates for Membership thirty days previous to the consideration by the Board of Direction of the applications, has proved of great value in securing desirable information as to those desiring to join the Society.

The Committee on Uniform Standard Time.

This Committee will present a report of progress at this meeting.

The Committee on Preservation of Timber.

This Committee presented at the Convention in June of the past year, a valuable report, which was published in full in the Transactions of the Society for July, and the appendices to which, written by a number of Members of the Society, and by others, were printed in the Transactions for August.

The Committee having completed its labors in the presentation of this report, was discharged from further duty by the Convention, with the thanks of the Society.

The Committee on a Uniform System for Tests of Cement.

The Committee on a Uniform System for Tests of Cement presented a report at the Annual Meeting of the past year, and also at the Convention in June last, and the Committee was then discharged, with the thanks of the Society.

The report was printed in the Transactions of the Society for November of the past year.

The Committee on the Compressive Strength of Cements and the Compression of Cements and Settlement of Masonry.

This Committee, appointed under the action of the Society at the last Convention, has inaugurated its labors by the issue of a circular of information.

It will make a report of progress at this meeting.

The Committee to Consider Changes in Organization.

This Committee was appointed under a resolution adopted at the business meeting of the Society during the last Annual Convention.

It is understood that a report will be presented at the present Annual Meeting.

The Committee to Confer with Kindred Societies for the Consideration of a Plan for Creating a Library for Joint Use.

This Committee was appointed under a resolution adopted at the last Annual Meeting of the Society, and has the subject entrusted to it still under consideration and progress.

Amendments to the Constitution.

At the last Annual Meeting, an amendment to the Constitution, providing for the compounding of annual dues by single payments, was discussed, amended and recommended to the Society for adoption. The vote on the amendment was canvassed at the meeting of the Society of March 4th, 1885, and was adopted by a large majority of the votes cast.

This amendment provides for the compounding for future annual dues by the payment of $250, with the provision that Members who, at any time, become resident, shall be, during such residence, liable to the payment of the difference between the annual dues of Resident and Non-Resident Members. All dues of every nature and kind may be compounded for by a total payment of $325.

The Norman Medal.

The Norman Medal for the year 1884 was awarded to paper No. 279, entitled Experiments on the Strength of Wrought-Iron Struts, the author being James Christie, M. Am. Soc. C. E.

The Board of Censors to award this medal for the past year will present its report at this meeting.

The Rowland Prize.

The Rowland Prize for 1884 was awarded to paper No. 274, entitled Water Power with High-Pressures and Wrought-Iron Water-Pipe, the author being Hamilton Smith, Jr., M. Am. Soc. C. E.

The Committee to award this prize for the past year will present its report at this meeting.

The Committee on the Proper Relation to Each Other of the Sections of Railway Wheels and Rails.

At the last Convention a resolution was presented authorizing the appointment of a Committee on this subject. This resolution was submitted to a vote by letter ballot, the vote being canvassed on October 7th, 1885, and the resolution was carried.

The organization of this Committee has not yet been perfected.

Junior Membership.

At the meeting of the Society of November 4th, 1885, a resolution was adopted requesting the Board of Direction to issue a circular calling the attention of the Members to the desirability of adding to the Junior membership, and of using their personal influence with young men towards inducing them to make application in the usual way for Junior membership.

This circular has been issued and sent to all the Members of the Society.

Membership Tables.

The following tables show the changes and additions during the year in the various classes of membership:

On January 1st, 1885, the date of the last report, the membership in the Society was:

Honorary Members, resident...	2	Non-resident....	8	Total...	10	
Corresponding Members.....		"	3	" ...	3	
Members, resident.....	130	"	527	"	657	
Associates "	12	"	22	"	34	
Juniors, "	16	"	61	"	77	
						—768
Making resident.....	160	Non-resident....	621			
Total.....						781

Fellows, 66, of whom 8 Members and 1 Honorary Member are included above, leaving..... 57

Subscribers to the Building Fund, 137, of whom 93 are entered in one or other of the above classifications, and 4 deceased, leaving 40

Total connected with the Society, January 1st, 1885.....878

At the present date, January 1st, 1886, the membership is:

Honorary Members, resident...	2	Non-resident....	6	Total...	8	
Corresponding Members.....		"	3	" ...	3	
Members, resident.....	131	"	570	"	701	
Associates, "	10	"	23	"	33	
Juniors, "	23	"	66	"	89	
						—823
Making resident.....	166	Non-resident....	668			
Total.....						834

Fellows, 62, of whom 8 Members are included above, leaving..... 54

Subscribers to the Building Fund, 139, of whom 92 are entered in one or other of the above classes, and 7 deceased, leaving 40

Total connected with the Society, January 1st, 1886.....928

The additions during the past year to the several classes of Society membership have been:

Members qualified	56
Associates qualified	2
Juniors qualified	15
Fellow qualified	1
Total additions to the several classes of membership	74
Subscribers to the Building Fund, 2, who are otherwise connected with the Society	00
Total additions	74

The decrease during the year in the several classes of membership has been:

Honorary Members	Died 2			2
Members	" 4	Resigned 4	Dropped 4	12
Associates	" 2	" 1		3
Juniors	Transferred to Members 3			3
Fellows	Died 4			4
Totals: Deaths 12, Resignations 5, Dropped 4, Transferred, 3				24

There has thus been an addition of 74 to the various classes of membership, and a decrease of 24, making the actual net additions during the year 50 in number.

On January 1st, 1885, there were, as stated in the last Annual Report, 18 proposals pending. Ninety-eight proposals have been received during the year; 51 candidates have been elected Members, of whom 3 were transferred from Juniors; 2 candidates have been elected Associates; 15 candidates have been elected Juniors.

Fifty-six persons have during the year qualified as Members; 2 have qualified as Associates; 15 have qualified as Juniors; 1 has qualified as Fellow; 4 candidates elected during the year as Members have not yet qualified. There are 21 proposals now pending.

Twenty-two meetings of the Society were held during the year, one of which was the Annual Meeting, held in New York, January 21st and 22d, and another the Annual Convention, held at Deer Park, Maryland, June 24th, 25th and 26th; all the sessions of the Convention, including the business meeting, being counted as one meeting of the Society. Meetings have been held on the first and third Wednesday of each month, except July and August.

Twenty-three meetings of the Board of Direction have been held during the year.

The Library has been increased during the year by the following additions:

Books and Pamphlets	709
Maps, Plans, Drawings, Charts, Photographs and Engravings	531

Reports made during the year have been as follows:

By the Board of Direction: The Annual Report.

By the Finance Committee: Annual Report on the Finances of the Society; Quarterly Reports to the Board of Direction.

By the Library Committee: Regular Monthly Reports on the Library and on Publications.

By the Secretary: Monthly Reports to the Board of Direction; Occasional Reports on Current Business.

By the Treasurer: The Annual Report of the Treasurer: Monthly Reports to the Board of Direction.

By the Committee on Uniform System for Tests of Cement: Final Report and the Committee discharged.

By the Committee on Preservation of Timber: Final Report and the Committee discharged.

By the Committee on Uniform System for Standard Time: One Report.

By the Nominating Committee: Two Reports.

The Society has lost by death during the term covered by this report two Honorary Members, Messrs. John B. Jervis and Emile Malézieux; four Members, Messrs. Theophilus E. Sickels, Henry M. Wightman. Wilmon W. C. Sites and Louis R. Walton; two Associates, Messrs. Henry H. Gorringe and Arba R. Haddock; and four Fellows, Messrs. William C. Kingsley, M. T. Seymour, Thomas C. Durant and Frederick W. Merz.

Respectfully submitted,

JOHN BOGART,

Secretary.

REPORT OF THE TREASURER FOR THE YEAR ENDING DECEMBER 31ST, 1885.

RECEIPTS.

Balance on hand December 31st, 1884:			
Building Fund	$426.03		
General Fund	4 550.87		
			$4 976.90
Receipts during year:			
Entrance Fees		$1 920.00	
Current Dues:			
From 93 Resident Members	$2 272.50		
" 384 Non-resident Members	5 605.87		
" 9 Resident Associates	135.00		
" 10 Non-resident Associates	100.00		
" 18 Resident Juniors	215.00		
" 56 Non-resident Juniors	535.00		
		$8 863.37	
Past Dues:			
From 12 Resident Members	$385.00		
" 40 Non-resident Members	569.50		
" 4 Resident Associates	75.00		
" 3 Resident Juniors	25.00		
" 1 Non-resident Junior	10.00		
		1 064.50	
Dues for year beginning January 1st, 1886:			
From 21 Resident Members	$512.50		
" 27 Non-resident Members	420.00		
" 2 Non-resident Associates	20.00		
" 1 Resident Junior	15.00		
" 4 Non-resident Juniors	40.00		
		1 007.50	
			10 935.37
Sales of Publications			1 023.66
Certificates of Membership			96.75
Advertisements			178.00
Interest on Fellowship Fund Bonds		$480.00	
" Savings Bank Deposit		32.96	
" Norman Medal Fund Bond		70.00	
" Railroad Stock		36.23	
" Rowland Prize Fund Bond		60.00	
" General Society Fund Bonds		120.00	
			799.19
Subscriptions to Building Fund			225.00
Fellowship Fees			150.00
Other sources			6.15
			15 334.12
			$20 311.02

DISBURSEMENTS.

Interest on Mortgage	$800.00	
Taxes	523.06	
Publications	5 627.86	
Stationery and Printing	822.96	
Postage	1 090.01	
Library	1 316.77	
Salaries	3 000.00	
Convention and Annual Meeting	1 066.74	
Janitor, House Supplies, Fuel, Water and Gas	1 616.91	
Certificates of Membership	106.40	
Insurance	200.83	
Norman Medal and Rowland Prize	133.60	
Other expenditures	336.79	
Finance—Treasurer's Books	525.00	
Work of Committees	514.35	
		$17 681.28
Payments from Building Fund		651.03
Transferred to Savings Bank		32.96
		$18 365.27
Balance on hand		1 945.75
		$20 311.02

The funds of the Society are as follows:

Fellowship Fund:	
Eighty-seven subscriptions to December 31, 1884.....	$9 200.00
Premium and accumulated interest December 31, 1884.	1 903.69
Fund on hand December 31, 1884.....	$11 103.69
One subscription during 1885.....	150.00
Interest received during 1885.....	482.96
	$11 736.65
Expended for publications during 1885.....	998.37
	$10 738.28
The present investment of the Fund is:	
Eight Pennsylvania Railroad Six per cent. Bonds, cost	9 889.32
Deposit in Seamen's Bank for Savings.....	848.96
	$10 738.28
Norman Medal Fund:	
One Certificate Croton Aqueduct Stock, New York City.....	1 000.00
Building Fund:	
Receipts previous to January 1, 1885.....	$17 517.00
" during 1885.....	225.00
	$17 742.00
Expended:	
For Legal Services, Circulars, etc.....	$355.03
For Improvements on Property.....	3 386.97
Payments on Purchase.....	14 000 00
	$17 742.00
Rowland Prize Fund:	
One Pennsylvania Railroad General Mortgage Six per cent. Bond, cost.....	$1 222.50

General Investment :

10 Shares New York Central and Hudson River Railroad Stock	$1 000.00
1 Consolidated Certificate New York Central and Hudson River Railroad Stock	35.00
2 Pennsylvania Railroad General Mortgage Six per cent. Bonds, cost	2 445.00
	$3 480.00

Respectfully submitted,

J. James R. Croes,

Treasurer.

REPORT OF THE COMMITTEE ON FINANCE.

Presented and Accepted at the Annual Meeting, January 20th, 1886.

The Finance Committee has the honor to report that they have performed the usual duty of auditing all the bills that have been paid by the Treasurer during the past year, and have found that each bill has been charged to its proper fund, and that the several sums have not exceeded the amounts appropriated by the Board of Direction for the purposes specifically mentioned. Also that the Committee has, at the end of the year, carefully examined all the assets of the Society, and has found that the reports of the Secretary and Treasurer give a correct account of the same.

A change has been made in the investment of the Society by selling $10\frac{35}{100}$ shares of the New York Central and Hudson River Railroad Stock, and buying 10 shares Consolidated Gas Company of New York City, and a balance of $62.50, which remained from proceeds of sale of the New York Central after purchasing the Gas Stock, has been deposited in the Seamen's Bank for Savings. This change of investment was not completed in time to appear on the Treasurer's books when written up to December 31st, 1885.

Respectfully submitted,

G. S. Greene, Jr.,

Wm. R. Hutton,

Finance Committee.

LIST OF PUBLICATIONS AND PAPERS RECEIVED FOR LIBRARY.

APPENDIX TO ANNUAL REPORT OF THE BOARD OF DIRECTION, JANUARY 20TH, 1886.

The following papers are contributed to the Society, or are received in exchange for Transactions:

American Architect and Building News	Weekly	Boston.
American Engineer	"	Chicago.
American Gas Light Journal	Semi-Monthly	New York.
Annales des Travaux Publics	Monthly	Paris.
Army and Navy Journal	Weekly	New York.
Builder	"	London.
Building and Engineering News	"	"
Bulletin American Iron and Steel Association	Semi-Monthly	Philadelphia.
Bulletin du Canal Interocéanique	"	" Paris.
Commissioner of Patents' Journal	Semi-Weekly	London.
Der Civilingenieur	Monthly	Leipsig.
Deutsche Bauzeitung	Weekly	Berlin.
Eizen Zeitung	"	Vienna.
Electrical Review	"	New York
Engineer	"	London.
Engineering	"	"
Engineering Era	Semi-Monthly	Cleveland.
Engineering and Mining Journal	Weekly	New York.
Engineering News and American Contract Journal	Semi-Monthly	"
Genie Civil	"	" Paris.
International Standard	Quarterly	Cleveland.
Iron	Weekly	London.
Iron Age	"	New York.
Journal of the Association of Engineering Societies	Monthly	"
Journal of Society of Arts	Weekly	London.
Journal of Gas Lighting	"	"
Locomotive	Monthly	Hartford.
Manufacturer and Builder	"	New York.
Manufacturer and Iron World	Weekly	Pittsburgh.
Magazine of American History	Monthly	New York.
Mechanical News	Semi-Monthly	"
Norsk Teknisk Tidsskrift	Monthly	Christiania.
Nouvelles Annales de la Construction	"	Paris.
Portefeuille Economique des Machines	"	"
Record of Scientific Literature	"	New York.
Railroad Gazette	Weekly	"
Railway Age	"	Chicago.
Railway Herald	Monthly	Buffalo.
Railway Review	Weekly	Chicago.
Railway World	"	Philadelphia.
Reportorium der Technischen Literatur		Leipsig.
Revue Générale des Chemins de fer	Monthly	Paris.
Sanitary Engineer	Weekly	New York.
Scientific American	"	"
Scientific American Supplement	"	"

Teknisk Tidsskrift	Monthly	Stockholm.
Techniker	Semi-Monthly	New York.
Telegraph Journal and Electric Review	" "	London.
Van Nostrand's Magazine	Monthly	New York.
Zeitschrift fur Bauwesens	Quarterly	Berlin.

The following are subscribed for :

American Bookseller	Semi-Monthly	New York.
American Library Journal	Monthly	"
Publishers' Weekly	Weekly	"
Science	"	Cambridge.
U. S. Official Postal Guide	Monthly	Boston.

The Society has received during the year, in exchange for the Transactions, official publications of the following associations, in many instances for preceding years :

Aeronautical Society of Great Britain	London.
Academy of Sciences	Washington.
Akademie des Bauwesens	Berlin.
American Institute of Architects	New York.
American Institute of Electrical Engineers	"
American Institute of Mining Engineers	"
American Iron and Steel Association	Philadelphia.
American Society of Mechanical Engineers	New York.
Annales de Construcciones Civiles y de Minas	Lima.
Annales des Ponts et Chaussées	Paris.
Argentine Scientific Society	Buenos Ayres.
Association of Civil Engineers	Lisbon.
Astor Library	New York.
Austrian Society of Engineers and Architects (Two Publications)	Vienna.
Boston Public Library	Boston.
Boston Society of Civil Engineers	"
Canadian Institute	Toronto.
Civil Engineers' Society of St. Paul	St. Paul.
Civil Engineers' Club of Cleveland	Cleveland.
Colegio N. Rosales	Culiacan, Mexico.
Die Administration der "Mittheilungen"	Vienna.
Engineer Department, U. S. A.	Washington.
Engineers' Club of Philadelphia	Philadelphia.
Engineers' Club of St. Louis	St. Louis.
Engineers' Society, Western Pennsylvania	Pittsburgh.
Franklin Institute Journal	Philadelphia.
Imperial Hochschule	Berlin.
Imperial School	Moscow.
Imperial Technic Society of Russia	St. Petersburg.
Imperial University	Tokio.
Institution of Civil Engineers	London.
Institution of Civil Engineers of Ireland	Dublin.
Institution of Engineers and Shipbuilders of Scotland	Glasgow.
Institution of Mechanical Engineers	London.
Iron and Steel Institute	"
Liverpool Engineering Society	Liverpool.
Massachusetts Institute of Technology	Boston.
McGill University, Department of Science	Montreal.
Mechanics' Institute	San Francisco.
Midland Institute Mining, Civil and Mechanical Engineers	Barnsley, Eng.

Military Service Institution of the United States.....Governor's Isld., N.Y.
Mining Institute of Scotland.....Hamilton.
New York Meteorological Observatory.....New York.
North of England Institute of Mining and Mechanical Engineers.....Newcastle-on-Tyne.
Rensselaer Society of Engineers.....Troy.
Riga Technical Society.....Riga.
Royal United Service Institution.....London.
School of Mines, Columbia College.....New York.
Seismological Society of Japan.....Tokio.
Smithsonian Institution.....Washington.
Society of Arts.....London.
Society of Civil Engineers.....Paris.
Society of Engineers.....London.
Society of Engineers and Architects.....Cologne.
Society of Engineers and Architecs.....Hannover.
Society of Engineers and Architects of Hungary.....Budapest.
Society of Engineers and Architects of Saxony.....Dresden.
Stevens Institute of Technology.....Hoboken.
Swedish Society of Engineers.....Stockholm.
Technical Society of the Pacific Coast.....San Francisco.
Technischen Hochschule.....Aachen.
Technischen Hochschule.....Hannover.
Thayer Scientific School, Dartmouth College.....Hanover.
United States Agricultural Department (Division of Forestry).....Washington.
United States Coast and Geodetic Survey..... "
United States Geological Survey..... "
United States Light-house Board..... "
United States Naval Institute.....Annapolis.
United States Naval Observatory.....Washington.
United States Ordnance Department..... "
United States Patent Office..... "
University of Michigan.....Ann Arbor.
Verein Deutscher Ingenieure.....Berlin.
Western Society of Engineers.....Chicago.

LIST OF MEMBERS.

ADDITIONS.

MEMBERS.		Date of Election.
Appleton, Ellery Cushing	Canajoharie, N. Y.	June 3, 1885.
Bonzano, Maximilian Ferdinand	Division Engineer Philadelphia and Reading R. R., Philadelphia, Pa.	Jan. 6, 1886.
Fuller, Franklin Ide	8 Stark st., Portland, Oregon,	" " "
Kittredge, George Watson	Engineer Maintenance of Way, Muskingum Valley Division, Pittsburgh, Cincinnati and St. Louis Ry., Zanesville, Ohio	" " "

		Date of Election.
REED, HENRY WADSWORTH	Master of Roadway, Savannah, Florida and Western Ry., Waycross, Ga.	Jan. 6, 1886.
RUDLOFF, HENRY FREDERIC	Chief Engineer Caracas and Antimano Ry., Caracas, Venezuela	" " "

CHANGES AND CORRECTIONS.

MEMBERS.

ATWOOD, WILLIAM H	Tampa, Florida.
BLACKWELL, CHARLES	Union Pacific Ry., Omaha, Nebraska.
CHILDS, JAMES E	General Manager New York, Ontario and Western Ry., 15 Broad st., New York City.
CUNNINGHAM, DAVID W	45 South Ninth st., Minneapolis, Minn.
DAVIS, JOSEPH P	1 East Ninth st., New York City.
DORAN, FRANK C	P. O. Box 179, Los Angeles, Cal.
FRITH, ARTHUR J	(Care Western Steel Co.), St. Louis, Mo.
GOAD, CHARLES E	4 Finsbury Circus, London, E. C., England.
GREENE, FRANCIS V	280 Broadway, New York City.
HOLMAN, M. L	77 East May st., St. Louis, Mo.
JENNINGS, WILLIAM T	38 Stanley Crescent, Toronto, Canada.
LATHAM, H. H	180 and 182 Monroe st., Chicago, Ill.
MANSFIELD, M. W	Superintendent Indianapolis and Vincennes R. R., Indianapolis, Ind.
MARSLAND, EDWARD	Room 156, Post Office Building, New York City.
MITCHELL, HENRY	U. S. Coast and Geodetic Survey, Washington, D. C.
ODELL, FREDERICK S	45 West One Hundred and Twenty-sixth st., New York City.
PAINE, CHARLES	128 West Fifty-ninth st., New York City.
VAN SANT, R. L	(Care Superintendent Maintenance of Way Texas and St. Louis Ry.), Texarkana, Texas.
VAUGHAN, F. W	De Funiak Springs, Florida.

JUNIORS.

BREITHAUPT, W. H	Berlin, Ontario, Canada.
MARVIN, CHARLES E	Road Department Louisville and Nashville R. R., Earlington, Ky.

DEATH.

FLINT, EDWARD A	Elected Member May 18, 1870; died January 23, 1886.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. XII.—February, 1886.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

FEBRUARY 3D, 1886.—The Society met at 20 o'clock, Vice-President Thomas F. Rowland in the Chair.

The following candidates were elected as Members: Edward William Eckert, Massillon, Ohio; James Ellison Mills, Quincy, Cal.; Edward Thomas Wright, Los Angeles, Cal. As Associates: George Lord Burrows, Saginaw, Mich.: Palmer Chamberlaine Ricketts, Troy, N. Y.

A paper by T. H. McKenzie, M. Am. Soc. C. E., on the Waterworks of Southington, Connecticut, was read and discussed.

FEBRUARY 17TH, 1886.—The Society met at 20 o'clock, J. James R. Croes, Treasurer Am. Soc. C. E., in the Chair.

The deaths of Mr. Edward A. Flint, M. Am. Soc. C. E., of Brookline, Mass., on January 23d, 1886, and of Mr. Louis R. Walton, M. Am. Soc. C. E., of Earlington, Ky., on November 9th, 1885, were announced.

A paper by Clemens Herschel, M. Am. Soc. C. E., On the Work Done for the Preservation of the Dam at Holyoke, Mass., in 1885, and on

some studies for a new stone dam for the same place was read by the author and discussed.

OF THE BOARD OF DIRECTION.

JANUARY 13TH, 1886.—Financial business was transacted. The draft of the Annual Report prepared by the Secretary was considered, and the Report adopted.

JANUARY 27TH, 1886.—In accordance with the provisions of the Constitution, the following Standing Committees were appointed:

On Finance.—Messrs. George S. Greene, Jr., W. Howard White, Henry G. Morris.

On Library.—J. James R. Croes, Thomas C. Keefer, William R. Hutton.

Applications were considered. Appropriations were made.

FEBRUARY 3D, 1886.—General business was transacted. It was ordered that the card calendar to be issued for the current year should have all time announcements on the 24-o'clock system.

ADDITIONS TO

LIBRARY AND MUSEUM.

From American Institute of Mining Engineers, Dr. R. W. Raymond, Secretary, New York City:

The Flow of Air and other Gases. Fred. W. Gordon.

The Product and Exhaustion of the Oil Regions of Pennsylvania and New York. Charles A. Ashburner.

The Engineer and the Wage-Earner. J. C. Baylis.

Note on the Contraction of Iron on Sudden Cooling. Henry M. Howe.

Note on an Exhibition of Banded Structure in a Gold Vein. Charles M. Rolher.

The Amalgamation of Gold Ores, and the Loss of Gold and Silver in Chloridizing-Roasting in the Stetefeldt Furnace. C. A. Stetefeldt.

Biographical Notice of Charles O. Thompson. Philip M. Moew.

The Picton Coal Field. Henry S Poole.

The Present Value of Steel Castings. Arthur V. Abbott.

The Distribution and Proportions of American Blast Furnaces. John Birkinbine.

The Works of the Blast Furnaces of the North Chicago Rolling Mill Co. Fred. W. Gordon.

A New Method for the Determination of Phosphorus in Iron and Steel. J. B. Mackintosh.

The Geology of Natural Gas. Charles A. Ashburner.

Gordon's Improved Whitwell-Coper Firebrick Hot-Blast Stove. Victor O. Strobel.

Basic Refractory Materials. T. Egleston.

Proceedings of the Forty-third Meeting, Halifax, Nova Scotia, September, 1885.

List of Officers, Members, Rules, etc., November, 1885.

The Improved Brücker Cylinders. R. W. Raymond.

Quicksilver Condensation at New Almaden. Samuel B. Christie.

An Electrical Furnace for Reducing Refractory Ores. Dr. T. Sterry Hunt.

Discussion of Professor Byron W. Cheever's Paper upon the Estimation of Manganese, Carbon and Phosphorus in Iron and Steel. A. E. Hunt and George H. Clapp.

Notes on Certain Iron Ore Deposits in Colorado. Charles M. Rolker.

The Wolf Benzine-Burning Safety Lamp. E. J. Schnitz.

Notes on the Leadville Ore Deposits. Charles M. Rolker.

Topographical Models: their Construction and Uses. A. E. Lehman.

The Sydney Coal Field, Cape Breton, N. S. W. Roulledge.

The Upper Measure Coal Field of Tennessee. Henry E. Colton.

From American Iron and Steel Association, Philadelphia:

A Letter to the Secretary of the Treasury on the Question of Tariff Revision, with an Appendix.

From American Society of Mechanical Engineers, Prof. F. R. Hutton, Secretary, New York City:

Transactions. Vol. VI. 1885.

From T. Appleton, East Saginaw, Mich.:

First Annual Report of the Board of Public Works of the City of East Saginaw, Mich., for the fiscal year ending January 5th, 1886.

From John W. Bacon, Danbury, Conn.:

Thirty-third Annual Report of the Railroad Commissioners of the State of Connecticut for 1885.

From Edward A. Barber, Philadelphia:

The *American Antiquarian* for October, 1883; January-July, 1884; May-September, 1885.

From H. A. Bentley, Newport, R. I.:

Report of the Consulting Engineers on Examination of the Sewerage System of the City of Newport, R. I., under the direction of the City Council, November 27th, 1885.

From William Bliss, President Boston and Albany Railroad, Boston:

Annual Reports of the Boston and Albany Railroad Company—1st to 4th, 1868 to 1871; 6th to 12th, 1873 to 1879; 14th to 18th, 1881 to 1885.

From James P. Bogart, New Haven, Conn.:

Fifth Report of the Shell-Fish Commissioners to the State of Connecticut to the General Assembly, January Session, 1880.

From Boston Public Library, Boston:

Thirty-third Annual Report of the Trustees of the Public Library. 1885.

From Bureau of Education, Washington, D. C:

Historical Sketches of the Universities and Colleges of the United States.

Circulars of Information of the Bureau of Education, Nos. 3 and 4. 1885.

From Bureau of Navigation, Navy Department, Washington, D. C.:

Naval Professional Papers, as follows:

No. 13—Magnetism: its Principles and Application to Ships and Compasses.

No. 14—Experiments with Steel.

No. 15—Ships, Guns and Armor.

No. 16—Engines, Boilers and Torpedo Boats.

No. 17—Magnetism of Iron and Steel Ships.

No. 18—Training of Enlisted Men.

Report of the Gun-Foundry Board, with Supplement. 1884.

Report of the British Naval and Military Operations in Egypt. 1882. Part 1, Text; Part 2, Plates.

Examples, Conclusions, and Maxims of Modern Naval Tactics. 1884. Text and Plates.

Papers on Naval Operations during the year ending July, 1885.

Report on the Exhibits at the Crystal Palace Electrical Exhibition, 1882.

Report upon the Comparative Merits of Anthracite and Bituminous Coal for Naval use.

Report of Lieutenant Giles B. Harber, U. S. N., of his Search for the Missing People of the Jeannette Expedition, etc.

Annual Report of the Secretary of the Navy for the year 1885.

Ships of War. Francis T. Bowles.

Report of the Surgeon-General of the Navy for the year 1884.

Register of the Commissioned and Warrant Officers of the Navy of the United States, including Officers of the Marine Corps. January 1, 1886.

From F. W. Bussing, Editor of the *Deutsche Bauzeitung*, Berlin, Prussia:

Hulfswissenschaften zur Baukunde. Part 1.

From Eliot C. Clarke, Boston:

Report of a Commission to Consider a General System of Drainage for the Valleys of the Mystic, Blackstone and Charles Rivers, Mass., 1886.

From L. E. Cooley, Evanston, Ill.:

A Rational Policy of Public Works. L. E. Cooley.

From Elmer L. Corthell, New York City:

The Atlantic and Pacific Ship Railway across the Isthmus of Tehuantepec, in Mexico, considered Commercially, Politically and Constructively. Elmer L. Corthell, Chief Engineer.

Discusion del Opusculo de E. Sweet. La Ampliacion Radical del Canal Erie. E. L. Corthell.

From William A Crafts, Clerk Board of Railroad Commissioners, Boston:

Sixth Annual Report of the Board of Railroad Commissioners for 1874.

Returns of the Railroad and Street Railway Corporations as reported to the Board of Railroad Commissioners for the year ending September 30, 1877.

Thirteenth Annual Report of the Board of Railroad Commissioners for the year 1881.

From Lieut Col Wm. P. Craighil, Baltimore:

Strategy and Tactics. Gen. G. H. Dufour.

From Joseph P. Davis, New York City:

Argument of Mr. James J. Storrow and Mr. Edward N. Dickerson for Mr. Bell and the Bell Company. In the Matter of Applications for Leave to Bring Suits in the Name of the United States to Cancel the Bell Patent, 174,405, of March 7, 1876.

Manufacturer and Builder. Vols. I to VII, 1869 to 1875, inclusive.

Trial of Lynn, Mass., Pumping Engine, 1873.

Specifications for Paving to be Executed for the Health Committee of the Borough of Liverpool.

Of Sewerage Work to be Executed for the Health Committee of the Borough of Liverpool.

Sheets of Apportionment of Cost of Paving, Channeling, Curbing and Flagging.

Boston, Mass., Municipal Register for the years 1873-74-75-77-79.

Auditor's Report of the City of Boston for the years 1872 to 1878, inclusive.

Thirty-third, Thirty-fourth and Thirty-fifth Annual Reports of the Board of Education of Boston, Mass., 1869 to 1871, inclusive.

The Census of Massachusetts for the year 1875. Vols. I, II and III.

Report of the School Committee of Boston, Mass., 1871-72-73-75.

Manuscript Record of Tests of Turbines.

Report of Boston Water Board on supply of Cochituate Water for East Boston, Mass., 1879.

First Annual Report of the Boston Water Board for the year ending April 30, 1877.
Thirty-fourth and Thirty-fifth Annual Reports of the Boston Fire Department, 1871-72.
Report of the Commissioners appointed to Investigate the Cause and Management of the Great Fire in Boston.
Report of a Commission appointed to Consider a General System of Drainage for the Valleys of Mystic, Blackstone and Charles Rivers, Mass.
A Digest of Decisions of Municipal Interest of the Supreme Judicial Court of Massachusetts, 1804-65.
Catalogue of the City Library, Lowell, Mass.
St. Louis, Mo., Mayor's Message, with accompanying documents. May Session, 1870.
A Pure Water Supply and its Preservation.
Thirteenth Annual Report of the Columbia Oil Company for the year 1874.
Report of the Metropolitan Drainage Commissioners for 1885.
Union Hydraulic Works. Catalogue and Price List.
Provisions of the Ship Railway Concession from the Mexican Republic to James B. Eads, May 9, 1885.
Assainissement de la Seine. Épuration et Utilisation des Eaux d'égout. Vo s. I and II, et Documents Administratifs.
Die Anlage Von Klärbecken und Rieselfeldern zur Reinigung der Abflüsse aus den Städtischen Schwemmsielen.
The Works of the Edgar Thompson Steel Company.

From E. B. Dorsey, London:

Annual Reports of the Board of Directors of the Pennsylvania Railroad Company, from 1883 to 1885.
Lockwood's Builder's and Contractor's Price Book for 1884.
Philips' special large scale War Map of the Soudan, extending to Suakim, on the Red Sea, with enlarged plan of Khartoum, 1885.
The Financial Reform Almanac for 1885.
Whitaker's Almanack for 1885.
International Inventions Exhibition Official Catalogues.

From George Downe, Randwick, Sydney, New South Wales, Australia:

Report by the Commissioner for Railways and Tramways of New South Wales for the year 1884.

From Dyckerhoff & Sohne, Amœneburg, Germany:

Uber die Entwickelung der Deutschen Cement Industrie und über die Methoden der Untersuchung des Cements unter Vorführung der dazu Erforderlische Apparate. Dr. Delbrück. Stettin. 1885.

From N. H. Egleston, Forestry Division, Agricultural Department, Washington, D. C.:

Value and Management of Government Timber Lands, and Distribution of North American Forest Trees.

From G. Howard Ellers, Chicago:

Report of Proceedings of the Illinois State Board of Health October 29 and 30, 1885.
A Proposed system of Water Supply for the Town of Jefferson, Ill., adjoining the City of Chicago.

From Engineers' Society of Western Pennsylvania, S. M. Wickersham, Secretary, Pittsburgh:

Standard Rail Sections and Fish-Bar Joints.
The Conveyance of Gas.
The Torsion Balance.

From George E. Evans, City Engineer Lowell, Mass.:

Five Photographs of Beacon Street Reservoir, Lowell, Mass.:

From M. N. Forney, New York City:

Report of the Proceedings of the Nineteenth Annual Convention of the Master Car-Builders' Association, held in the Hygeia Hotel, at Old Point Comfort, Va., June 9, 10, 11 and 12, 1885.

From Franklin Institute, Philadelphia:

Report of Examiners of Section XXII, Electric Signalizing and Registering Apparatus, etc.
Report of a Special Committee on Competitive Tests of Dynamo-Electric Machines, and on Mechanical and Electrical Tests of Conducting Wires.
Report of Examiners of Section XII, Gas Engines.

From E. A. Gieseler, Superintendent of Construction, Fourth Light-house District, Philadelphia:

Paper on Tidal Theory and Tidal Predictions (reprinted from *Franklin Institute Journal*, March, 1885.)

From Charles Glackmeyer, City Clerk, Montreal, Canada:

Reports on the Accounts of the Corporation of the City of Montreal, and Reports of the City Officials for the year 1884.

From John C. Goodrich, Jr., New York City:

Can the Temperature of the Atlantic States be Changed? (reprinted from *Scientific American* of October 31, 1885.)

From George S. Greene, Jr., Engineer-in-Chief Department of Docks, New York City:

Annual Report of the Department of Docks for the year ending April 30, 1885, together with the Minutes of the Department for the same year.

From William Hamilton, Superintendent Toronto Water-works, Toronto, Canada:

Annual Report of the City Engineer and Manager of the Water-works, for the year ending December 31, 1883.

From E. W. Harrison, Jersey City, N J.:

Comparative Schedules showing the Location, Cost of Equipment, Annual Earnings, Operating Cost, Expenses, Taxes, etc., of Railroads in New York, Pennsylvania, Massachusetts, Connecticut and Ohio.

From Gen. W. B. Hazen, Chief Signal Officer U. S. A., Washington, D. C.:

Professional Papers of the Signal Service, No. XVIII.
Thermometer Exposure.
Annual Report of the Chief Signal Officer of the Army to the Secretary of War, for the year 1884.

From Major David Porter Heap, Engineer-Secretary U. S. Light-house Board, Washington, D.C.:

Annual Report of the Light-house Board to the Secretary of the Treasury, for the fiscal year ended June 30, 1885.

From Frank W. Hodgdon, Boston:
Annual Report of the Harbor and Land Commissioners for the year 1885.

From Louis M. Haupt, Philadelphia:
The American Engineering Register, 1885.

From N. H. Hutton, Baltimore:
Annual Report of the Harbor Board for the fiscal year ending December 31, 1885.

From William A. Ingham, Secretary Board of Commissioners Second Geological Survey of Pennsylvania, Harrisburgh:
Second Report of Progress in the Anthracite Coal Region. Part I.
The Geology of Natural Gas in Pennsylvania and New York.
The Product and Exhaustion of the Oil Regions of Pennsylvania and New York.
Report of Cameron, Elk and Forest Counties. Part II.
Report of Huntingdon County, T, 3, and of Delaware C, 5, and Atlas Eastern Middle Anthracite Field.
Grand Atlas, Div. II, Part II; Div. IV, Part I: and Div. V, Part I.

From Institute of Engineers and Shipbuilders. W. J. Millar, Secretary, Glasgow, Scotland:
Transactions. Vol. XXVIII, 1884–85.

From Institution of Civil Engineers, James Forrest, Secretary, London:
Proceedings. Vol. LXXXI, 1884–85, Pt. III.
Proceedings. Vol. LXXXII, 1884–85, Pt. IV.
Brief Subject Index. Vols. LIX to LXXXII, Sessions 1879–80 to 1884–85.
The Signaling of the London and North Western Railway. Arthur Moore Thompson (with an abstract of the discussion upon the paper).
The Semicircular Timber Roof-Truss designed by the late Captain F. Fowke, R. E. Gilbert Richard Redgrave.
Spanish Tidal Flour Mills. Alexander Fairlie Bruce.
The Copper Mines of Butte City, Montana, with an Estimate of the Amount and Cost of Production. David William Brunlon.
On Rivers Flowing into Tideless Seas: illustrated by the River Tiber. William Shelford (with an abstract of the discussion upon the paper).
Erection of a Howe Truss Bridge over the first crossing of the Columbia River, British Columbia, on the Canadian Pacific Railway. Charles Anthony Stoess.
Machinery for the Manufacture of Nitrate of Soda at the Ramirez Factory, Northern Chili. Robert Harvey.
The Iron Bridges on the Hull, Barnsley and West Riding Junction Railway. Frederick Milfrid Scott Stokes.
Abstract of Papers in Foreign Transactions and Periodicals.
A Series of Lectures on the Theory and Practice of Hydro-Mechanics
Corrosion of Metals during Long Exposure in Sea Water. Thomas Andrews.
Mouth of the River Rhone. Adolphe Guérard.
Electric Lighting for Railway Trains. William Stroudley.
Removal of Shoals by Propeller-Sluicing on the Columbia River, Oregon, U. S. Harry Hawgood.
Inland Navigation in Europe. Sir Charles A. Hartley.
Forms of Ships. Sir Edward J. Reed.
Tides and Coast Works. Thomas Stevenson.
The Design and Construction of Railway Rolling Stock in Italy. S. Fadda.
The Construction of Locomotive Engines. William Stroudley.
Experiments on the Measurement of Water over Weirs. Bryan Donkin and Frank Salter.
The Oil Wells of Baku. F. Vasilieff.
Heat in its Mechanical Applications: A Series of Lectures delivered at the Institution of Civil Engineers. Session 1883–84.
On the Energy of Fuel in Locomotive Engines. Granville Calyle Cuningham.
The Salt Industry of Stassfurt. Hilary Bauerman.
The Karachi Water-works. James Strachan.
Concrete Building at Simla, India. Walter Smith.
On an Improved Method of Lighting Vessels Under Way at Night. Bradford Leslie.

From M. R. Jefferds, London:
The Panama Canal: Its History, its Political Aspects, and Financial Difficulties. J. C. Rodrigues.
Chemin de fer à Rail unique surélevé: system Lartigue.
Distances, Topographies, and Curved Lines in any way and direction.

From William W. Jefferis, West Chester, Penn:
A New General Atlas exhibiting the five great divisions of the globe. By M. Walter Brun. 1828.
Historical Collections of the State of Pennsylvania for the year 1843.
History of the 97th Regiment Pennsylvania Volunteer Infantry during the War of the Rebellion, 1861–65.

From William A. Jefferis, New York City:
Railroad Gazette from April 1 to December 30, 1871.
Van Nostrand's Eclectic Engineering Magazine, April to December, 1870.
American Edition of the British Encyclopedia. 1817.
Annual Register of the Rensselaer Polytechnic Institute, 1866.
Official Army Register for 1867.
Riverside, Chicago, Ill., in 1871, with a description of its improvements, together with some engravings of views and buildings.
Sixteenth Annual Report of the President and Directors of the Northern Central Railway Company for the year 1870.
Railroad Communication Across the Continent, with an account of the Central Pacific Railroad of California for May, 1867, and February, 1868.
The Union Pacific Railroad from Omaha, Nebraska, across the Continent: its Construction, Resources, Earnings and Prospects for January and May, 1867.
Opinion on the Validity and Sufficiency in Law of the First Mortgage Bonds of the Union Pacific Railroad Company.
An Act to Aid in the Construction of a Railroad and Telegraph Line from the Missouri River to the Pacific Ocean; approved July 1, 1862.
By-Laws of the Board of Directors, together with the Charter of the Wilmington and

Reading Railroad Company, and the supplement for the year 1866.
Report of the Directors of the Wilmington and Reading Railroad Company for the year 1869.
Sixth Annual Report of the Board of Commissioners of Prospect Park, Brooklyn, for the year 1866.
Circular Pamphlet of the Philadelphia Hydraulic Water-works for 1871.
Contract for Cross-Ties Painesville and Youngstown Railroad Company.
Contract of Painesville and Hudson Railroad.
Fairmount Park: Sketches of its Scenery, Waters and History, for the year 1871.

From E. H. Keating, Halifax, N. S:
Report on the Wooden Graving Dock at St. John's, Newfoundland. E. H. Keating.

From Charles Latimer, Cleveland, Ohio:
Atlantic and Great Western Railroad Chart. Financial and Operating Statistics of the Road for a Period of Fourteen years.

From J. Fras. Le Baron, Jacksonville, Fla.:
Constitution and By-Laws of the Southern Society of Civil Engineers, Jacksonville, Fla.

From L. J. Le Conte, Oakland, Cal:
Are Not Dynamite Catastrophes Intimately Associated with Electric Phenomena? L. J. Le Conte. From Transactions of the Technical Society of the Pacific Coast, August, 1885.

From Capt. D. A. Lyle, Ordnance Department U. S. A., Boston:
Annual Report of the Operation of the United States Life Saving Service for the fiscal year ending June 30, 1884.

From Manchester Ship Canal Company, Manchester, England:
Manchester Ship Canal. Description of the Project now before Parliament, January, 1884.
Reply of Mr. Pember, Q. C., on behalf of the Promoters of the Bill.
A Reply to Mr. A. Provand's Address. Criticism by a Supporter of the Canal.
How the Railway Companies are Crippling British Industry and Destroying the Canals.
Some Local Considerations in relation to the proposed Manchester Ship Canal.
Engineers' Reports and Reports of the Provisional Committee.
The London Daily and Periodical Press on the Question.
Map of the Manchester Ship Canal, with a Description of the Plans prepared for the Session 1885.

From Charles C. Martin, Brooklyn:
Report of the Trustees of the New York and Brooklyn Bridge for the year ending December 1st, 1885.

From Robert K. Martin, Chief Engineer Water Department, Baltimore, Md.:
Report of the Water Department of the City of Baltimore, for the years 1864, 1865, 1867, 1868, 1870, 1872 to 1874, 1877, 1879, 1880, 1884.

From C. A. McNeale, Secretary St. Paul Chamber of Commerce St. Paul, Minn.:
Annual Report of the St. Paul Chamber of Commerce for the year ending December 31st, 1884.

From A. Marichal, Philadelphia:
Manual of the Curvograph. A. Marichal, C. E.

From Mining Institute of Scotland James Barrowman, Secretary, Hamilton:
Official Catalogue of Exhibits of the Mining Exhibition held at Burnbank Drill Hall, Great Western Road, Glasgow, under the auspices of the Mining Institute of Scotland, 1st till 24th September, 1885.

From Gratz Mordecai, New York City:
A Report on the Terminal Facilities for Handling Freight for the Railroads entering the Port of New York.
Map of New York City and surroundings. Illustrating and accompanying a report on the Terminal Facilities for Handling Freight of the Railroads entering the Port of New York for 1885.

From George S. Morison, New York City:
Lithographed Drawing of Deck Span of New Omaha Bridge, Central Pacific Railroad.
Specifications for Superstructure of New Bridge across the Missouri River at Omaha, Neb.
Report of the President and Directors of the Ohio and Mississippi Railway Company to the Stockholders for the year ending June 30, 1885.
The Eighth, Eighteenth, Twentieth, Twenty-first, Twenty-second and Twenty-third Annual Reports of the Maine Central Railroad Company for the years 1878-80 to 1884.

From New York State Board of Health, Albany:
Monthly Bulletin for August, September, October, November and December, 1885.

From Prof. Simon Newcomb, U. S. N., Supt. American Ephemeris and Nautical Almanac, Washington, D. C.:
The American Ephemeris and Nautical Almanac, Washington, D. C.
Astronomical Papers prepared for the use of the American Ephemeris and Nautical Almanac, Vol. II, Parts III and IV; and Vol. III, Part IV, 1885.

From Gen John Newton, Chief of Engineers U. S. A., Washington, D. C.:
Official Army Register for January, 1886.
Report from the Mississippi River Commission recommending an immediate appropriation of $50,000 for the general work of surveys.
Report of the Missouri River Commission recommending an immediate appropriation.
Report of the Joint Commission for the Completion of the Washington Monument.
Report relating to Causeways, Bridges, etc., in process of erection, that may interfere with navigation.
Advertisements, Specifications and Proposals, as follows:
Ice Pier at Point Pleasant, W. Va.
Improving Harbor at Cleveland, Ohio.
Toledo Harbor, Ohio.
Dredging at Ogdensburg Harbor, New York
Removal of Wrecks in the Delaware River.
Proposals for Rubble Stone.

Furnishing Rip-rap Granite for the Eastern Jetty at Nantucket, Mass, and placing the same in the Jetty.
Proposals for the Weighing and for the Purchase of Iron removed from the Wreck of the Steamer Nankin, New York Harbor.
Removal of the Wreck of the Steamship Perkwinen.
Replacing the Concrete and Wooden Platforms for Heavy Guns by Concrete Platforms for the same Guns, at Forts Jackson and St. Philip, La.
For Supplies and Material.
Removal of the Wreck of the Steamer Dictator, now laying in Harbor at Tampa, Florida.
Removing Obstructions in East River and Hell Gate, New York.
Timber for Gates and Wickets of Lock and Dam No. 6.
Removal of the Wreck of the Sunken Scow now lying in Harbor at Tampa, Florida.
Fairport Harbor, Ohio.
Repairs of Bridge over the Moat at Fort Montgomery, N. Y.

From New York Meteorological Observatory, Department of Public Parks, Dr. Daniel Draper, Director, New York City:

Abstract of Registers from Self-recording Instruments, October and November, 1885.

From William Ripley Nichols, Boston:

A Study of the Relative Poisonous Effects of Coal and Water Gas.
An Address before the Section of Chemistry of the American Association for the Advancement of Science at Ann Arbor, August, 1885.

From Richard B. Osborne, Philadelphia:

Select Plans of Engineering Structures for Railroads and Highways.

From W. B. Parsons, Jr., New York City:

The New York District Railway Company, with the Opinions of the Press, Letters, etc.

From E. Pontzen, Paris, France:

Étude practique sur la Cement de Portland Fabrication, Proprietes, Emploi. E. Candlot.
Les Chemins de Fer Russes, 1857-62.

From J. W. Powell, Director United States Geological Survey, Washington, D. C.:

On the Organization of Scientific Work of the General Government.

From George W. Rafter, Rochester, N.Y:

Final Report on Construction of the Fredonia Water-works at Fredonia, Chautauqua County, N. Y. G. W. Rafter.

From Rektor Technischen Hochschule, Hanover, Germany:

Catalogue of the Library of the Technical High School, Berlin, Germany.

From Henry H. Remfoy, Calcutta, India:

Pamphlet on Patents, Information and Forms for India, Ceylon, Straits Settlements and Hong Kong.

From John A. Russell, San Francisco, Cal.:

San Francisco Municipal Reports for the Fiscal Year 1884-85, ending June 30th, 1885.

From D. C. Sanford, New Haven, Conn.:

Proceedings of the Connecticut Association of Civil Engineers and Surveyors, held at Middletown, Conn., September 25th, 1885.

From Major Alfred F. Sears, Brockton, Mass.:

Paper on the Glover System. Disposal of the Sewage of Brockton, 1885.

From Hon. J. B. Shaw, New York City:

New York Supreme Court. In the Matter of the Petition of the New York Cable Railway Company, Vol. I., containing Record of Proceedings before Supreme Court Commissioners, including Articles of Associations and Map of Petitioner's Routes of Railway.
Objectors' case before Guy R. Pelton, William C. Traphagen and Leroy B. Crane, Vols. I and II.
Proceedings of Commissioners of Rapid Transit of New York for 1884.
Report of Commissioners.
Vols. I and II. General Term, First Department. In the Matter of the Petition of the New York Cable Railway Company. Vol. I. Record of Proceedings, Vol. II, Petitioners' Proofs.
Concluding Argument by Charles P. Shaw.

From Massachusetts State Board of Health, Lunacy and Charity, Boston:

Sixth Annual Report of the State Board of Health, Lunacy and Charity of Massachusetts for 1884-85.

From Prof. George F. Swain, Boston:

Twenty-first Annual Catalogue of the Officers and Students of the Massachusetts Institute of Technology, with a statement of the Courses of Instruction for 1885-86.

From Hon. E. Sweet, State Engineer and Surveyor, Albany, N. Y.:

Report of Canal Commissioners, State of New York, for 1876.
Annual Financial Report of Auditor for 1880.
Annual Report of Auditor on Tolls, Trade and Tonnage of the Canals for 1854, 1873, 1881.
Annual Report of State Engineer and Surveyor on the Canals for 1882.

From Robert Surtees, Ottawa, Canada:

Annual Report of the Water-works Committee for the year ending October 31, 1885, with Official Report.

From William F. Switzler, Chief of Bureau of Statistics, Washington, D. C.:

Annual Report and Statements of the Chief of the Bureau of Statistics on the Foreign Commerce and Navigation, Immigration and Tonnage of the United States, for the fiscal year ending June 30, 1885.

From Union Bridge Company, New York City:

Photograph of Kentucky and Indiana Bridge.
Photograph of the Double Cantilever Bridge over the Ohio River, between Louisville and New Albany, now being erected by the Union Bridge Company.

From U. S. Coast and Geodetic Survey, Washington, D. C.

Report of the Superintendent of the U. S. Coast and Geodetic Survey, showing the progress of the work during the fiscal year ending with June, 1884.

From United States Geological Survey, Washington, D. C.:

Mineral Resources of the United States, 1883 and 1884.

Bulletins of the United States Geological Survey, Nos. 7-23.

From United States Naval Institute, Annapolis, Md.

Proceedings, Vol. XI, No. 4.

From Irving S. Upson, Librarian Rutgers College, New Brunswick, N. J.:

Catalogue of the Officers and Students of Rutgers College 1885-86.

From D. Van Nostrand, New York City:

A Practical Treatise on Hydraulic Mining in California. Aug. J. Bowie, Jr.

From George W. Van Siclen, New York City:

Guide to Buyers and Sellers of Real Estate; how to Draw a Contract, etc.

From Prof. George L. Vose, Boston:

A Sketch of the Life and Works of Loammi Baldwin, Civil Engineer.

From Welton & Bonnett, Waterbury, Conn.:

Nineteenth Report of the Board of Water Commissioners of the City of Waterbury, Conn., for the year ending December 31st, 1885.

From A. M. Wellington, New York City:

Profile and Tracing of Georgetown, Breckenridge and Leadville Railway; also statement published in *Railroad Gazette* of November 27th, 1885.

From Edmund B. Weston, Providence, R. I.

Bulletin of the New England Meteorological Society for July, August, September, October, November and December, 1885.

From W. Howard White, New York City:

Railroad Gazette for July, August, September and October, 1879.

Report upon the Contemplated Metropolitan Railroad of the City of New York. A. P. Robinson.

From Albert Williams, Jr., Chief of Division of Mining Statistics and Technology United States Geological Survey, Washington, D. C.

Statistics of the Production of the Precious Metals. By Clarence King. 1881.

Placer Mines and Mining Ditches.

The Mining of Gold and Silver.

Popular Fallacies regarding Precious Metals.

Mining Geology of the Eureka District, Nevada. J. S. Curtis.

Geological Sketches of the Precious Metal Deposits of the Western United States. S. F. Emmons.

Abstract of a Report upon the Geology and Mining Industry of Leadville, District of Colorado. S. F. Emmons.

Mineral Products of the United States, 1882 and 1884.

Chart showing the Mineral Products of the United States in the calendar years 1882, 1883 and 1884.

From Prof. De Volson Wood, Hoboken, N. J.:

The Luminiferous Æther.

From William E. Worthen, New York City:

Record of Meeting of Common Council of the City of Albany, November, 30th, 1885, containing report of William E. Worthen on Sources of Additional Water Supply for Albany.

From Col. Carroll D. Wright, Chief of Bureau of Statistics of Labor, Boston:

Fifth, Seventh, Tenth and Sixteenth Annual Reports of the Bureau of Statistics of Labor. Massachusetts.

Statistics of Drunkenness and Liquor Selling under Prohibitory and License Legislation, 1874 and 1877.

Intemperance and Crime.

Fall River, Lowell and Lawrence.

The Canadian-French in New England.

The Working Girls of Boston.

Employers' Liability for Personal Injuries to their Employees.

Industrial Conciliation and Arbitration. Complied by Carroll D. Wright. Boston, 1881.

Labor Laws of Massachusetts. Compiled from Public Statutes. 1884.

Reports of the 1st, 2d and 3d Annual Sessions of the National Convention of Chiefs and Commissioners of Bureaus of Statistics of Labor in the United States. 1883, 1884 and 1885.

From Charles G. Yale, Secretary Technical Society of the Pacific Coast, San Francisco, Cal.:

Transactions, Vol. I, March to December, 1884; and Vol. II, January to September, 1885; and Record of Meetings for September 5th and October 3d, 1884.

From other sources:

Safety Electric Power Company. Daft System.

Forty-fifth Annual Announcement of Lectures and Catalogue University of the City of New York, Session 1885-86.

Report of the Proposed Extension of the Water-works East of Rockville Centre.

Artillery and Engineering Review for December, 1885. Rome, Italy.

Ingegneria (Elettriata-strade ferate Tramways Idraulica Miniere, c. c. c.) Architectura Decorazione ed ornamentazione. 1886.

Ueber den Betrieb auf den Canälen in Nord America.

The Free Press, London, England:

Vol. V. 1857.

Vol. VI. July to December, 1858. Incomplete.

Vols. VII and VIII. January 26th, 1859, to December 5th, 1860.

Vols. IX and X. January 1st, 1861, to December 3d, 1862.

Vols. XI, XII and XIII. January, 1863, to December, 1865.

The Diplomatic Review, London, England:

Book IV, Vols XIV to XVIII. January, 1866, to October, 1870.

LIST OF MEMBERS.

ADDITIONS.

MEMBERS.

		Date of Election
ECKERT, EDWARD WILLIAM	Engineer Massillon Bridge Co., Massillon, Ohio	Feb. 3, 1886.
KILLEBREW, SAMUEL	Saltillo, Coahuila, Mexico	Sept. 2, 1885.
MILLS, JAMES ELLISON	Quincy, Plumas Co., Cal	Feb. 3, 1886.
SCHERZER, ALBERT JOHN	(Care W. H. Harned), 206 South 4th st., Philadelphia, Pa	Jan. 6, 1886.
SPENCER, SAMUEL	Vice-President Baltimore and Ohio R. R., Baltimore, Md.	Sept. 2, 1885.
WRIGHT, EDWARD THOMAS	County Surveyor, Los Angeles, Cal	Feb. 3, 1886.

ASSOCIATES.

BURROWS, GEORGE LORD	Saginaw, Mich	Feb. 3, 1886.
RICKETTS, PALMER CHAMBERLAINE	17 First st., Troy, N. Y.	Feb. 3, 1886.
TOMKINS, CALVIN	387 South st., New York City	Jan. 6, 1886.

FELLOW.

COOPER, EDWARD	17 Burling slip, New York City,	Dec. 10, 1885.

CHANGES AND CORRECTIONS.

MEMBERS.

ANDREWS, DAVID H	70 Kilby st., Boston, Mass.
BURNET, GEORGE, JR	Box 535, St Louis, Mo.
COMSTOCK, CYRUS B	Lt.-Col. Corps of Engineers, Bvt. Brig.-Gen., U. S. A., Willets' Point, Whitestone P. O., N. Y.
DRAKE, WILLIAM A	(Care Engineer Department), Atchison, Topeka and Sante Fé R. R., New Kiowa, Kansas.
GOLAY, PHILIP	Vevay, Indiana.
HINCKLEY, JOHN F	Chief Engineer Paris and Great Northern Ry., Paris, Texas.
KITTREDGE, GEORGE W	Engineer Maintenance of Way, Cincinnati and Muskingum Valley Ry., Zanesville, Ohio.

NICHOLS, O. F.....Contractor, Westerly, R. I., and Chief Engineer Water-works, Westerly, R. I.
NICOLLS, WILLIAM J.....313 Walnut st., Philadelphia, Pa.
NOBLE, ALFRED.....(Care D. Wallace), 24 Alexandrine ave. West, Detroit, Mich.
OSGOOD, JOSEPH O.....(Care Toledo, Cincinnati and St. Louis R. R.), Toledo, Ohio.
PAINE, CHARLES.....Vice-President Philadelphia Co., 933 Penn ave., Pittsburgh, Pa.
ROGERS, ALBERT B.....Faribault, Rice Co., Minn.
SMITH, ISAAC W.....Engineer Portland Water Committee (Box 42), Portland, Oregon.
SMITH, JARED A.....Major Corps of Engineers, U. S. A., Portland, Maine.
STAATS, ROBERT P.....361 West 20th st., New York City.
WURTELE, ARTHUR S. C.....165 Niagara st., Buffalo, N. Y.

JUNIORS.

FRANCIS, GEORGE B.....235 West 128th st., New York City.
SCHAUB, JULIUS W.....(Care Dominion Bridge Co.), Montreal, Canada.

RESIGNATIONS.

MEMBERS.

DABNEY, FREDERICK Y.....Jan. 31, 1886.
ROEBLING, WASHINGTON A.....Feb. 5, 1886.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. XII.—March, 1886.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

MARCH 3D, 1886.—The Society met at 20 o'clock, W. Howard White, Director Am. Soc. C. E., in the Chair. The following candidates were elected as Members: Danforth Hurlbert Ainsworth, Newton, Iowa; Decatur Axtell, Richmond, Va.; William Herbert Burr (elected Junior, June 3, 1874; elected Associate, May 5, 1880), Phœnixville, Pa.; Albert Lucius, Brooklyn, N. Y.; Robert Edwin Peary, Washington, D. C.; Charles de la Cherois Burdon, Van Buren, Arkansas; James Robert Wardlaw, New York City. As Associate: Clayton Colman Hall, Baltimore, Md. As Junior: George Washington Vaughan, Steubenville, Ohio.

The election as Fellow of the Society of Edward Cooper, New York City, was announced.

A paper by Fred Brooks, M. Am. Soc. C. E., on Thermometer Scales, was read and discussed.

A paper, by H. V. Hinckley, M. Am. Soc. C. E., on Errors in Railroad Levels, was read and discussed.

MARCH 17TH, 1886.—The Society met at 20 o'clock, Vice-President Thomas C. Keefer in the Chair.

A synopsis of a paper by Desmond FitzGerald, M. Am. Soc. C. E., on Evaporation was given by the author, and the subject was discussed.

A discussion by George Downe, M. Am. Soc. C. E., on English and American Railroads Compared, was read.

OF THE BOARD OF DIRECTION.

MARCH 10TH, 1886.—Applications were considered. The time and other details of the Convention to be held at Denver were discussed.

The receipt was announced from Major F. H. Parker, Corps of Ordnance, U. S. A., commanding Watertown Arsenal, of the results of tests to determine frictional resistance of steel between shrinkage surfaces.

The tests were ordered published in the Proceedings.

MEMOIRS OF DECEASED MEMBERS.

JOHN GRIFFEN, M. Am. Soc. C. E.

DIED JANUARY 14TH, 1884.

John Griffen was born in Westchester County, New York, in the year 1812. Before he had completed his first year, death deprived him of his father. Thus his education devolved upon his mother until his fourteenth year, when he commenced attending a Friends' Boarding School in Dutchess County, New York. Upon completing his education he entered the mercantile establishment of an uncle in the City of New York, and continued there until his majority. His talents for engineering and mechanical pursuits were developed in the iron-works and nail factory of R. C. Nichols, at Norristown, where he was employed as bookkeeper in 1843. Under his direction the iron-works of Moore & Hooven, of the same place, were erected, and while thus engaged, he conceived and successfully applied a novel method of using the waste heat from the heating and puddling furnaces for generating the steam necessary to run the engines. The works of Reeves, Abbott & Co. were also constructed by him, and afforded additional opportunity for the display of his remarkable executive abilities. Until 1856 he remained in the employ of this Company in the capacity of Superintendent, during which time he introduced the governor for controlling the speed of steam engines used in rolling iron, which was regarded as a desideratum of the highest importance. Although numerous contrivances connected with the manufacture of iron proceeded from his fruitful brain, his invention for making wrought-iron cannon was sufficient to place his name high upon the roll of American inventors. After repeated experiments by the Government to test the strength of this ordnance, it was accepted as one of great value, and many hundreds of these guns were made by the Phœnix Iron Company, and, known as the "Griffen Gun," were used during the War of the Rebellion.

From Safe Harbor, he went to Phœnixville to take charge of the celebrated iron-works of that place, where he remained until 1862. Other inventions of his followed which are regarded of great importance in facilitating the operations connected with the iron industry, notable among which may be mentioned a machine for rolling the large wrought-iron beams used in building, for which he obtained a patent in 1857. This continues in successful operation. For many years he rolled the largest beams in the world.

In 1862, he engaged to erect the Buffalo Union Iron-works, which, although built at so early a period, are classed among the best in this country.

The position of civil and mechanical engineer having been tendered him by the Phœnix Iron Company in 1867, it was accepted, and eighteen months later he was again placed in charge. During his incumbency he erected the new and large works for that company.

In 1837 he was married to Esther, daughter of Reuben Leggett, of New York, by whom he had five children, of whom only one survives. Two years after the death of his first wife he married her sister, by whom he had five children, four of whom are living. Robert, the eldest son, was in the United States Navy, having graduated at the Naval School. He lost his life by yellow fever while in the service of his country.

Mr. Griffen was one of the directors of the Phœnixville Iron Company, and also a member of the firm of Clarke, Reeves & Co., the celebrated bridge-builders. Although devoted to business pursuits he found time to perform the duties appertaining to positions of public usefulness. In 1857 he was elected Burgess of Phœnixville, and he afterwards became a member of the School Board. While occupying that important position he was largely instrumental in advancing common school education, and in improving the school buildings.

Mr. Griffen was a man whose character impressed itself on all whom he met. He was honest, straightforward, and upright in all his ways. He was a good citizen, a good husband, a good father, and a good friend.

His memory was wonderful for its extent and its accuracy; what he knew he knew thoroughly, and he never pretended to know more than he did know.

After his visit to Europe in 1878, where he saw all the great iron and steel manufactories, he delighted to tell of his experience, and draw just comparisons between their methods and our own, with that absolute fairness which so much distinguished him. During his long and painful illness his intellectual vigor never forsook him, and he died as he had lived, a good Christian and an honest man.

Mr. Griffen became a Member of the American Society of Civil Engineers April 15th, 1868.

REDMOND JOHN BROUGH, M. Am. Soc. C. E.

DIED JULY 21ST, 1883.

Redmond John Brough, late City Engineer of Toronto, Ontario, was the eldest son of the late Secker Brough, Esq., Judge of the County Court of the County of Huron. After a short preparation in the University of Toronto, he began active practice in 1870, under Mr. Thomas Weatherall, C. E., on the Ontario Government Survey for the drainage of a portion of the County of Huron. In June of the same year he received an appointment on the engineering staff of the Great Western Railway of Canada, and was engaged in the preliminary and location surveys of the Canada Air Line Railroad. In November he was appointed assistant engineer on the western division of that road, which position he held up to the date of the completion of construction in July, 1873. He was then put in charge of the work of double-tracking a section of the main line of the Great Western Railway. On the completion of this work in November, 1873, he received, on the recommendation of Mr. John Kennedy, then Chief Engineer of the Great Western Railroad, an appointment as assistant engineer on the Toronto Water-works, under Mr. P. A. Peterson, Chief Engineer, which position he held up to 1876. At that date Mr. Peterson resigned and Mr. Brough was appointed resident engineer in charge of the construction of the works under the late City Water Commission. He was soon after appointed Chief Engineer and Manager of the Water-works. On the resignation of Mr. Frank Shanly, in 1878, he was appointed to succeed that gentleman as City Engineer of Toronto, and held this position up to the time of his death. On the 12th of July, 1883, while inspecting a portion of the city works, he was thrown from his carriage, breaking his thigh and receiving serious internal injuries, which resulted in his death, after a painful illness, on the 21st of the same month. He was in his thirty-seventh year at the time of his death, which closed a career which had promised to be more than usually successful. His abilities as an engineer were of a high order, and were united with good judgment and strict integrity. He enjoyed the respect and good-will of all who came in contact with him, and died sincerely mourned by many friends.

He was an Associate Member of the Institution of Civil Engineers, London, and a Member of the American Society of Mechanical Engineers.

He was admitted as a Member of the American Society of Civil Engineers September 1st, 1880.

LIST OF MEMBERS.

ADDITIONS.

	MEMBERS.	Date of Election.
AINSWORTH, DANFORTH HURLBERT	Newton, Iowa	March 3, 1886.
AXTELL, DECATUR	Receiver Richmond and Alleghany R.R., Richmond, Va.	March 3, 1886.
BURR, WILLIAM HERBERT	(Elected Junior, June 3, 1874, elected Associate, May 5, 1880) Assistant to Chief Engineer Phœnix Bridge Co., Phœnixville, Pa.	March 3, 1886.
LUCIUS, ALBERT	Chief Engineer Brooklyn, Bath and West End R. R., 211 Eleventh st., South Brooklyn, N. Y.	March 3, 1886.
PEARY, ROBERT EDWIN	Civil Engineer, U. S. N., Washington, D. C.	March 3, 1886.
PURDON, CHARLES DE LA CHEROIS	Engineer in charge Arkansas River Bridge, St. Louis and San Francisco Ry., Van Buren, Ark.	March 3, 1886.
WARDLAW, JAMES ROBERT	Assistant Engineer, Department Public Works, 31 Chambers st., New York City	March 3, 1886.

ASSOCIATE.

HALL, CLAYTON COLMAN	Actuary to the Insurance Department, State of Maryland, Baltimore, Md	March 3, 1886.

JUNIOR.

VAUGHAN, GEORGE WASHINGTON	Supervisor Sub-Division 3, Pittsburgh, Cincinnati and St. Louis Ry., Steubenville, Ohio	March 3, 1886.

CHANGES AND CORRECTIONS.

CORRESPONDING MEMBER.

FOX, SIR DOUGLAS	2 Victoria Mansions, Victoria st., Westminster, S. W., London, England.

MEMBERS.

APPLETON, ELLERY C.....Resident Engineer Burlington and Missouri River R. R. in Nebraska, Ashland, Neb.

CROWELL, J. FOSTER.....Engineer of Construction Pennsylvania R. R., 131 Maplewood ave., Germantown, Philadelphia, Pa.

DORAN, FRANK C.....Richmond, Indiana.

GREENE, GEORGE S., JR.....Engineer-in-Chief Department of Docks, Pier A, foot of Battery Place, North River, New York City.

HARRIS, WILLIAM P.....581 Washington ave., Brooklyn, N. Y.

HEGEMAN, WILLIAM W.....Engineer and Superintendent Heman Clark & Co., Contractors, Kansas City Extension, Chicago, Milwaukee and St. Paul Ry., Ottumwa, Iowa.

MOORE, CHARLES E.....San Jose, Cal.

NICHOLS, WILLARD A.....First Assistant Engineer Department of Docks, Pier A, foot of Battery Place, North River, New York City.

TOWLE, STEVENSON.....Consulting Engineer, 25 Chambers st., New York City.

VAUGHAN, F. W.....President Louisville Bridge and Iron Co., Consulting Engineer Louisville and Nashville R. R., Louisville, Ky.

JUNIORS.

HAVILAND, ARTHUR.....City Engineer's Office, San Antonio, Texas.

RAYMOND, CHAS. WARD.....(Care Sooysmith & Co.) 52 Montauk Block, Chicago, Ill.

THE NORMAN MEDAL.

CODE OF RULES FOR ITS AWARD.

I.—Competition for the Norman Medal of the American Society of Civil Engineers shall be restricted to members of the Society.

II.—There shall be one gold medal, and only one, struck for each and every fiscal year of the Society, and awarded as hereinafter provided. The dies therefor shall be with the Superintendent of the United States Mint at Philadelphia, in trust exclusively for the above purpose. Such medal shall be of a cost equal to the annual interest received upon $1 000 of the Consolidated Stock of the City of New York, Certificate No. 179, of the additional new Croton Aqueduct Stock of the City of New York, authorized by an Act of the Legislature of the State of New York, Chap. 230, passed April 15th, 1870, dated November 17th, 1873, now held in trust by the Treasurer of this Society, and so held solely for this purpose, and shall be executed upon his order.

III.—All original papers presented to the Society by members of any class, during the year for which the medal is awarded, shall be open to the award, provided that such papers shall not have been previously contributed in whole or in part to any other association, nor have appeared in print prior to their publication by the Society, nor have been presented to the Society in any previous year.

IV.—The Board of Censors to award the medal shall consist of three members of the Society, to be designated by the Board of Direction. The Secretary of the Society shall act as Secretary to the Board of Censors.

V.—The medal shall be awarded to such paper as the said Board shall judge to be worthy of special commendation for its merits as a contribution to engineering science, not merely relatively as compared with others presented during the same year, but as exhibiting the science, talent or industry displayed in the consideration of the subject treated of, and for the good which may be expected to result from the discussion and the inquiry.

VI.—In case no paper presented during the year shall be deemed of sufficient value to receive an award, the amount of the interest of the fund for that year shall be expended by the Board of Direction in the purchase of books, to be offered as a premium for the second best paper in the next year in which more than one paper of sufficient value may be presented.

VII.—The medal year shall terminate on the first day of August, and the award shall be announced at the annual meeting.

VIII.—The Treasurer of this Society shall cause the medal to be prepared and delivered to, or deposited to the order of, the successful competitor, within two months after the annual meeting at which the same shall have been awarded.

THE ROWLAND PRIZE.

CODE OF RULES FOR ITS AWARD.

Not more than one prize shall be awarded each year for papers presented during the year. The year shall terminate on the first day of August, and the award shall be announced at the annual meeting in January.

The prize shall consist of fifty dollars in cash.

The award shall be made by a committee consisting of the Secretary and two members of the Society, to be appointed by the Board of Direction.

The prize shall be awarded to such paper as the committee deem most worthy of such recognition, the preference being given to papers describing in detail accomplished works of construction, their cost and manner of execution, and the errors in design and execution.

American Society of Civil Engineers.

PROCEEDINGS MARCH, 1886.

REPORT OF MECHANICAL TESTS

MADE WITH THE

U. S. TESTING MACHINE,

CAPACITY 800,000 POUNDS,

AT WATERTOWN ARSENAL, MASS.,

MARCH 2D, 1886,

— FOR —

THE ORDNANCE DEPARTMENT, U. S. A., WASHINGTON, D. C.

These Reports are furnished by direction of General S. V. BENÉT, *Chief of Ordnance, U. S. A., for publication in the Proceedings of the American Society of Civil Engineers.*

TESTS BY COMPRESSION.

FRICTIONAL RESISTANCE OF STEEL HOOPS SHRUNK ON STEEL TUBES.

The hoops and tubes were received at Watertown Arsenal in their assembled state, having been prepared and shrunk together at West Point Foundry under the supervision of Lieut. R. Birnie, Ordnance Department, U. S. A.

The estimated temperature of the 3-inch hoop when taken from the furnace to assemble was 470 degrees Fah., that of the 4-inch hoop 515 degrees Fah.

At Watertown Arsenal the accessible diameters were measured before unhooping, and again after unhooping; the several diameters making equal angles with each other. The unhooping was done by forcing the hoops from the tubes in the direction of their axes.

One end of a tube rested against the flat platform of the testing machine, a cast-iron ring being used between the opposite platform and the hoop.

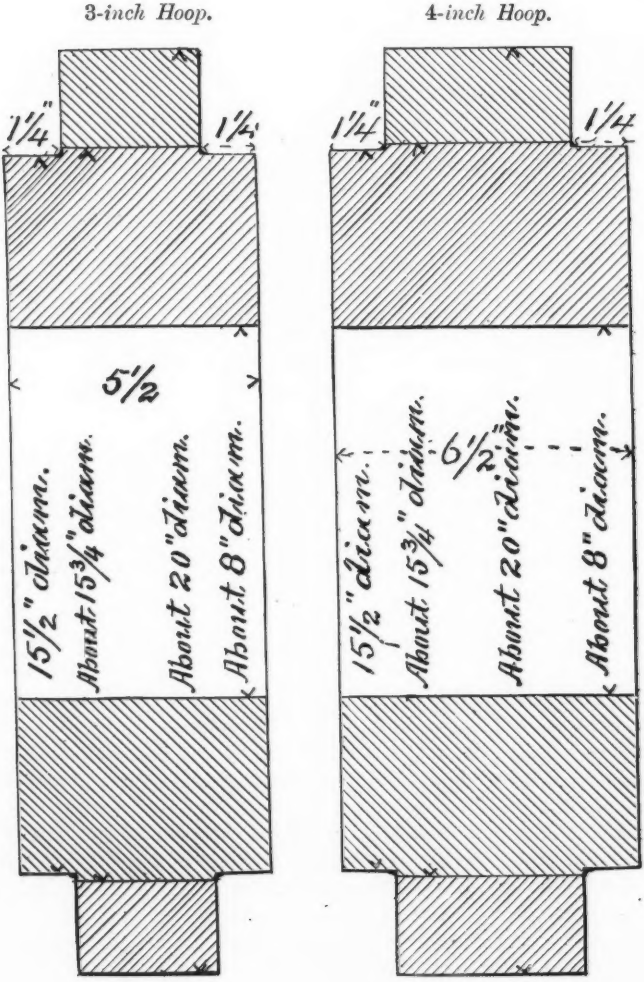
In the details of the tests are shown the apparent movement of the hoops on the tubes during the progress of the loading, up to the maximum resistance, and afterwards the diminishing loads on the hoops at intervals until they were wholly removed from the tubes.

Intervals of rest of longer or shorter duration were allowed, and the effect on the frictional resistance observed.

The hoops did not slip over the tubes with a smooth, continuous movement, but with a series of sudden slips or throbs, during which there were fluctuations of the loads.

Water was sprinkled upon the assembled parts while they were hot, which is thought to account for its presence on the frictional surfaces after unhooping.

DIMENSIONS OF HOOPS.



Difference in shrinkage diameters after unhooping—
3-inch hoop and tube..... 0.016434 inch.
4-inch hoop and tube..... 0.016350 inch.

Maximum frictional resistance found—
3-inch hoop and tube..... 265 800 pounds.
4-inch hoop and tube..... 404 100 pounds.

EXTERIOR DIAMETERS OF 3-INCH HOOP.

Before Unhooping.

DISTANCE FROM TOP.	DIAMETERS.				MEANS.
	1	2	3	4	
Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
0.5	20.0165	20.0164	20.0156	20.0158	20.016075
1.5	20.0164	20.0162	20.0153	20.0152	20.015775
2.5	20.0159	20.0158	20.0146	20.0147	20.015250

Mean.....20.0157

After Unhooping.

0.5	20.0042	20.0043	20.0041	20.0042	20.004200
1.5	20.0041	20.0038	20.0038	20.0038	20.003875
2.5	20.0036	20.0034	20.0033	20.0033	20.00340

Mean..... 20.003825
Restoration..... 0.011875 inch.

MEASUREMENTS OF BORE OF TUBE WITH 3-INCH HOOP.

Before Unhooping.

0.50	7.9946	7.9953	7.9952	7.9954	7.995125
2.75	7.9960	7.9961	7.9957	7.9957	7.995875
5.00	7.9968	7.9969	7.9970	7.9968	7.996875

Mean 7.995958

After Unhooping.

0.50	7.9970	7.9971	7.9971	7.9975	7.997175
2.75	7.9980	7.9984	7.9980	7.9985	7.998225
5.00	7.9988	7.9988	7.9988	7.9988	7.998800

Mean..... 7.998066+
Mean restoration 0.002108 + inch.

EXTERIOR DIAMETERS OF 4-INCH HOOP.

Before Unhooping.

DISTANCE FROM TOP.	DIAMETERS.				MEANS.
	1	2	3	4	
Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
0.5	20.0246	20.0246	20.0246	20.0246	20.024600
2.0	20.0238	20.0238	20.0238	20.0237	20.023775
3.5	20.0226	20.0226	20.0226	20.0222	20.022500

Mean..... 20.023625

After Unhooping.

0.5	20.0137	20.0138	20.0142	20.0142	20.013975
2.0	20.0124	20.0123	20.0128	20.0128	20.012575
3.5	20.0109	20.0112	20.0112	20.0110	20.011075

Mean..... 20.012541 +
Restoration..... 0.011084 + inch.

MEASUREMENTS OF BORE OF TUBE WITH 4-INCH HOOP.

Before Unhooping.

0.50	7.9919	7.9919	7.9919+	7.9918	7.991875
3.25	7.9903+	7.9903	7.9902	7.9903	7.990275
6.00	7.9923	7.9921+	7.9922	7.9921+	7.992175

Mean..... 7.991441 +

After Unhooping.

0.50	7.9945	7.9945+	7.9941	7.9944	7.994375
3.25	7.9931	7.9933	7.9930	7.9930	7.993100
6.00	7.9947	7.9947	7.9946	7.9944	7.994600

Mean..... 7.994025 inches.
Mean restoration 0.002584 inch.

INTERIOR DIAMETERS OF HOOPS AFTER UNHOOPING.

3-inch Hoop.

DISTANCE FROM TOP.	DIAMETERS.				MEANS.
	1	2	3	4	
Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
0.5	15.7463	15.7462	15.7463	15.7463	15.746275
1.5	15.7451	15.7450	15.7452	15.7452	15.745125
2.5	15.7459	15.7460	15.7459	15.7461	15.745975

Mean..... 15.745791 inches.

4-inch Hoop.

0.5	15.7456	15.7459	15.7462+	15.7460	15.745925
2.0	15.7458	15.7462	15.7468	15.7462	15.746250
3 5	15.7459	15.7461	15.7462	15.7462	15.746100

Mean..... 15.746092 inches.

EXTERIOR DIAMETERS OF TUBES AFTER UNHOOPING.

Tube with 3-inch Hoop.

0.5	15.7625	15.7626	15.7627	15.7625	15.762575
1.5	15.7620	15.7620	15.7621	15.7620	15.762025
2.5	15.7621—	15.7620	15.7621+	15.7621	15.762075

Mean..... 15.762225 inches.

Tube with 4-inch Hoop.

0.5	15.7617	15.7620	15.7620	15.7620	15.761925
2.0	15.7623	15.7624	15.7625	15.7624	15.762400
3.5	15.7628	15.7623	15.7631	15.7628	15.763000

Mean..... 15.762442 inches.

FRICTIONAL RESISTANCE BETWEEN TUBE AND 3-INCH HOOP.

Details.

APPLIED LOADS.	MOVEMENT	TIME.	REMARKS.
Pounds.	Inches.		
50 000	0	....	Initial load.
89 000	0		
100 000	.0006	....	Micrometer measurements were taken between
150 000	.0014		the hoop and face of holder of testing ma-
200 000	.0024		chine. Hence the apparent movement of the
220 000	.0025		hoop on the tube includes the compression
240 000	.0035		of the cast-iron fixture.
245 000	.0038		
250 000	.0030		
260 000	.0030	....	Maximum frictional resistance.
265 800	.....	....	Sudden slip of hoop on tube.
.....	.0504	....	After the slip.
132 000	.....	....	Continues the movement.
130 400	.1138		
Micrometer measurements now taken from holder to holder.			
128 000	.1138	....	Rested 10 minutes.
137 000	.1140		
140 000	.1140		
143 900	.....	....	Maximum resistance after the rest.
.....	.....	....	Sudden slip, load and reading now.
116 000	.1220	....	
127 000	.1257		
125 000	.1260	....	Rested about 3 minutes.
136 500	.1275		
140 000	.....	....	Sudden slip.
122 000	.1338	....	After slip.
128 000	.2650	....	Movement continues.

The hoop kept in motion, the resistance varying from 128 000 to 138 000 pounds, with unsteady movement as before. A final sudden slip of the hoop reduced the load to 113 000 pounds, the total movement being .4970 inch when the test was discontinued. Time, 12:50 P.M.

Contact surfaces in sight were slightly rusty, which it is thought took place after the surfaces were exposed to the air.

After a rest under zero load of 25 hours 45 minutes, the loading was renewed.

113 000	.4970		
145 400	.....	....	Maximum resistance after above rest.
104 200	.5074	....	After sudden slip.
142 800	.52	Sec.	
133 000	.53	38	
136 000	.54	34	
129 000	.55	19	
141 000	.56	19	
136 000	.575	28	
137 000	.588 / .59	24	
137 000	.60	22	

FRICTIONAL RESISTANCE BETWEEN TUBE AND 3-INCH HOOP.

Details.—Continued.

APPLIED LOADS.	MOVEMENT	TIME.	REMARKS.
Pounds.	Inches.	Sec.	
137 000	.612	22	
135 000	.625	19	
.....	.6375	23	
136 500	.64	24	
136 800	.65		
134 000	.662	18	
136 500	.675	20	
129 800	.684	15	
136 800	.698	19	
122 000	.7045	10	
136 400	.7165	18	
127 000	.725	13	
135 500	.7375	15	
128 000	.746	12	
128 900	.7545	12	
130 000	.764	13	
128 200	.775	11	
133 500	.786	18	
128 000	.794	11	
128 000	.804	14	
128 800	.814	11	
128 000	.8225	13	
128 400	.832	13	
128 100	.842	11	
135 000	.856	18	
129 000	.866	13	
128 000	.875	13	
128 500	.886	14	
128 200	.896	13	
127 000	.905	13	
129 000	.916	14	
135 200	.931	19	
128 000	.941	15	
127 000	.951	13	
128 200	.961	13	
127 100	.972	14	
127 100	.983	15	
127 400	.994	13	
127 200	1.00	19	
98 000	1.00	....	Rested 15 minutes.
125 000	.....	....	Maximum resistance after above rest.
117 000	1.10		
115 000	1.20	48	
113 000	1.30	52	
109 000	1.40	51	Number of Throbs between Readings.
105 000	1.50	52	
101 500	1.60	54	
97 500	1.70	47	11
91 000	1.80	48	12
84 000	1.90	50	13

FRICTIONAL RESISTANCE BETWEEN TUBE AND 3-INCH HOOP.

Details.—Continued.

APPLIED LOADS.	MOVEMENT	TIME.	Number of Throbs between Readings.	REMARKS.
Pounds.	Inches.	Sec.		
75 000	2.00	47	14	
68 000	2.10	48	14	
63 800	2.20	44	16	
57 000	2.30	44	16	
52 500	2.40	42	17	
47 500	2.50	42	22	
42 000	2.60	41		
39 900	2.70	34		
37 400	2.80	73		
31 000	2.90	73		

Frictional surface of the tube well polished, but retains marks of the turning tool.

Corresponding surface of the hoop shows no material change in its appearance resulting from the test.

FRICTIONAL RESISTANCE BETWEEN TUBE AND 4-INCH HOOP.

Details.

APPLIED LOADS.	MOVEMENT	TIME.	REMARKS.
Pounds.	Inches.		
50 000	0	....	Initial load.
100 000	.0024	....	Micrometer readings taken from holder to holder.
150 000	.0048		
200 000	.0068		
220 000	.0079		
240 000	.0089		
260 000	.0096		
280 000	.0102		
300 000	.0109		
320 000	.0118		
340 000	.0127		
350 000	.0132		
360 000	.0138		
370 000	.0143		
380 000	.0146		
390 000	.0149		
400 000	.0154		

FRICTIONAL RESISTANCE BETWEEN TUBE AND 4-INCH HOOP.

Details.—Continued.

APPLIED LOADS.	MOVEMENT	TIME.	REMARKS.
Pounds.	Inches.		
404 100	.....	....	Sudden slip. Maximum frictional resistance.
129 700	.0848	....	Load and reading after slip.
211 000	.0930	....	Continues the motion.
173 300	.2581	....	Rested 10 minutes.
187 800	.....	....	Maximum resistance after above rest. Motion caused without sudden slip.
193 800	.39		
202 000	.40	Sec.	
191 700	.41	65	
192 000	.42	27	
191 800	.43	32	
196 200	.44	31	
162 900	.45	24	
193 800	.46	23	
195 500	.47	25	
182 000	.48	..	
189 000	.49	..	
186 000	.50	7	
187 200	.51	9	
188 200	.52	9	
185 500	.53	9	
188 100	.54	9	
188 000	.55	9	
187 800	.56	8	
189 100	.57	10	
187 800	.58	9	
190 400	.59	10	
189 200	.60	8	
189 700	.61	9	
190 300	.62	8	
188 800	.63	9	
190 600	.64	10	
190 200	.65	10	
190 900	.66	10	
191 200	.67	8	
190 400	.68	9	
191 400	.69	10	
190 600	.70	9	
191 600	.71	9	
189 800	.72	9	
184 000	.73	8	Sudden slip.
188 000	.74	10	
184 000	.75	8	" "
190 400	.76	9	
183 000	.77	8	" "
188 000	.78	10	" "
189 000	.79	11	" "
180 000	.80	8	" "
187 000	.81	11	" "
189 000	.82	8	" "

FRICTIONAL RESISTANCE BETWEEN TUBE AND 4-INCH HOOP.

Details.—Continued.

APPLIED LOADS.	MOVEMENT	TIME.	REMARKS.
Pounds.	Inches.	Sec.	
188 000	.83	9	
188 500	.84	11	
188 000	.85	6	
188 900	.86	13	
188 000	.87	6	
189 000	.88	12	
180 000	.89	9	Sudden slip.
178 000	.90	5	" "
179 000	.91	15	" "
.....	.92	6	
183 000	.93	11	
.....	.94	11	" "
176 000	.95	5	
189 800	.96	14	
182 900	.98	19	
173 900	1.00	..	Test discontinued. Time, 12:11 P.M.

Friction surfaces slightly rusty, occuring after exposure to the air. A few drops of water observed at the joint of the hoop and tube after the discontinuance of the test.

Test resumed after a rest of 26 hours 35 minutes under zero load.

100 000	1.00		
182 900	1.0060		
190 000	1.0085		
198 800	.....	....	Sudden slip.
145 000	1.0234	....	Load and reading after slip.
221 000	.....	....	Sudden slip. Maximum resistance after resting.
171 000	1.0817		
182 000	.....	....	Continues the movement.
186 000	1.10		
202 000	1.1375	Sec.	
178 000	1.145	49	
208 000	1.17	34	
188 000	1.1865	34	
183 000	1.19	25	
189 000	1.205	13	
182 000	1.218	26	
179 000	1.220	18	
193 000	1.238	19	
175 000	1.24	18	
185 000	1.255	14	
176 000	1.267	24	
179 000	1.27	13	
182 000	1.2816	11	
174 800	1.293	21	
178 000	1.307	20	
172 000	1.31	12	
172 800	1.319	7	

FRICTIONAL RESISTANCE BETWEEN TUBE AND 4-INCH HOOP.

Details.—Continued.

APPLIED LOADS.	MOVEMENT	TIME.	REMARKS.
Pounds.	Inches.	Sec.	
170 000	1.332	18	
172 000	1.344	19	
174 800	1.357	18	
166 000	1.36	11	
171 000	1.369	7	
173 800	1.382	20	
169 800	1.393	17	
173 000	1.407	19	
164 000	1.41	11	
174 000	1.425	13	
165 000	1.433	18	
166 000	1.444	12	
174 000	1.4605	24	
163 000	1.47	18	
168 500	1.461	11	
170 000	1.477	23	
168 000	1.493	23	
162 000	1.503	15	
163 500	1.5135	14	
163 000	1.525	13	
164 500	1.5375	20	
158 000	1.54	9	
161 000	1.549	7	
163 000	1.561	14	
161 000	1.572	16	
161 500	1.585	16	
159 500	1.5955	15	
161 000	1.6080	16	
158 000	1.619	17	
159 800	1.6315	13	
161 500	1.649	22	
160 500	1.6645	20	
148 000	1.672	10	
159 500	1.689	21	
158 500	1.7045	19	
140 000	1.7115	11	
143 000	1.7190	7	
141 000	1.728	10	
148 000	1.736	9	
153 000	1.747	23	
144 000	1.753	18	
151 000	1.762	22	
149 500	1.77	23	
159 500	1.785	34	
139 000	1.79	17	
149 000	1.799	23	
148 000	1.808	20	
143 000	1.8145	18	
148 000	1.823	23	
148 000	1.832	21	

FRICTIONAL RESISTANCE BETWEEN TUBE AND 4-INCH HOOP.

Details.—Continued.

APPLIED LOADS.	MOVEMENT	TIME.	REMARKS.
Pounds.	Inches.	Sec.	
154 000	1.846	33	
139 000	1.8515	17	
145 000	1.86	20	
144 000	1.868	20	
142 000	1.875	19	
143 000	1.883	20	
152 000	1.8975	30	
134 000	1.9020	17	
143 500	1.91	20	
153 000	1.925	29	
123 000	1.998	..	
116 000	.....	..	Rested 15 minutes.
139 500	.....	..	Sudden slip.
145 000	.....	..	Maximum resistance after 15 minutes' rest.
			Number of Throbs between Readings.
128 000	2.12		
123 000	2.22	54	
114 000	2.30	46	12
110 000	2.42	39	14
105 000	2.50	44	15
99 400	2.62	50	15
93 800	2.72	49	16
88 000	2.82	45	17
83 500	2.92	45	18
78 500	3.02	44	18
74 300	3.12	48	19
69 200	3.22	46	18
64 600	3.42	87	34
59 900	3.52	46	14
54 500	3.62	44	13
51 500	3.72	43	15
51 800	3.82	42	11
46 000	3.92	58	12

After a movement of the hoop of 1.10 inches there was a succession of sudden slips, continuing through the remainder of the test.

Frictional surface of the tube well polished in a higher degree than the surface of the tube with the 3-inch hoop. The remaining tool marks also were deeper.

No material change produced on the corresponding surface of the hoop.

F. H. PARKER,
Major Ordnance Department, U. S. A.,
Commanding.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. XII.—April, 1886.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

APRIL 7TH, 1886.—The Society met at 20 o'clock, J. James R. Croes, Treasurer Am. Soc. C. E., in the chair. The following candidates were declared elected as Members: Howard Nixon Elmer, St. Paul, Minn.; John Butler Johnson, St. Louis, Mo.; Charles Ward Raymond (elected Junior November 7, 1877), Chicago, Ill.; William Burroughs Ruggles, Cincinnati, O.; George Edward Thackray (elected Junior September 6, 1882), Pittsburgh, Pa.; Ignacio Maria de Varona, Brooklyn, N. Y. As Associates: Samuel Stockton Bogart, New York, N. Y.; James Jackson Dana, New York, N. Y.; Henry Ayling Phillips, Worcester, Mass.; Frederick Stafford Young, Troy, N. Y. As Juniors: John Quincy Barlow, Tacoma, Wash. Ter.; John Joseph Donovan, North Yakima, Wash. Ter.; Stancliff Bazen Downes, New York, N. Y.; George Alfred Ricker, Buffalo, N. Y.; William Tuttle Shepard, New Haven, Ct.; Walter Obadiah Titus, Eagle Pass, Texas; Edward Ernest Russell Tratman, New York, N. Y.

The ballot on the following proposed amendment to the By-Laws was canvassed with this result: In the affirmative, 115 votes; in the negative, none.

The amendment is as follows:

By-Laws, Section 24, Clause 2d, final paragraph. Amend by substituting the following:

"When two or more persons have the highest and an equal number of votes at any election for officers, the Society shall elect the officer from among those having the highest and equal number of votes."

The amended clause will then read as follows:

2d. If it should appear that for any office a majority of the votes cast was not for one person, the meeting shall proceed to vote by ballot in the usual way for such officer, the choice of candidates being limited to the two persons not elected for whom the greatest number of votes had been previously cast for such office. When two or more persons have the highest and an equal number of votes at any election for officers, the Society shall elect the officer from among those having the highest and equal number of votes.

This amendment having been proposed in writing and seconded at the regular meeting of February 3d, 1886, submitted to vote of the Members by letter-ballot, and two-thirds of all the votes cast being in favor thereof, was declared duly adopted.

The paper by Joseph M. Wilson, M. Am. Soc. C. E., "On Specifications for Strength of Iron Bridges," was discussed by Messrs. Joseph M. Wilson and Theodore Cooper.

Mr. T. C. McCollom, M. Am. Soc. C. E., explained an apparatus made for the purpose of determining in 24 hours whether a cement is sound and safe to use, in connection with other tests. This apparatus has been presented to the Society by Mr. Henry Faija, of London.

APRIL 21ST, 1886.—The Society met at 20 o'clock, Mr. F. Collingwood, M. Am. Soc. C. E., in the chair.

A sketch by R. L. Harris, M. Am. Soc. C. E.. with drawings and memoranda of the ferry steamer Solana, by Arthur Brown, Superintendent Bridges and Buildings Central Pacific Railway, was read and discussed by Messrs. Emery, Dorsey, Striedinger, Macdonald, Collingwood and R. L. Harris.

The paper previously presented by Albon P. Man, Jr., M. Am. Soc. C. E., "Suggestions as to Flattening Ends of Railroad Curves," was discussed by Mr. A. M. Wellington.

OF THE BOARD OF DIRECTION.

MARCH 31ST, 1886.—Applications were considered, appropriations were made, financial business was transacted.

APRIL 28TH, 1886.—Applications were considered, financial business transacted.

ADDITIONS TO

LIBRARY AND MUSEUM.

From S. Thayer Abert, Washington, D. C.:

Annual Report upon the Improvement of certain Rivers and Harbors in Maryland, Virginia and North Carolina.

From American Academy Arts and Sciences, Boston:

Proceedings May, 1885, to October, 1885. New series. Vol. XIII, Part I.

From Admiral Daniel Ammen, U. S. N., Washington, D. C.:

The Certainty of the Nicaragua Canal contrasted with the Uncertainties of the Eads' Ship Railway.

From American Institute of Mining Engineers. Dr. R. W. Raymond, Secretary, New York City:

The Classification and Composition of Pennsylvania Anthracites. Chas. A. Ashburner.

Note on a Deposit of Fire Sand in Clinton County, N. Y. Alfred F. Brainerd.

The Sampling of Cast-Iron Borings. Porter W. Shimer.

Note on the Apatite Region of Canada. T. Sterry Hunt.

The Specific Gravity of Low Carbon Steel. George S. Miller.

The Nova Scotia Gold Mines. E. Gilpin.

The Process used at the Comstock for Refining Coppery Bullion produced by Amalgamating Tailings. A. D. Hodges, Jr.

Proceedings of the Forty-fourth Annual Meeting, Pittsburgh, February, 1885.

The Mineral Resources of the Hudson's Bay Territories. Robert Bell.

Professional Ethics. J. C. Bayles.

Recent Failures of Steel Boiler Plates. Wm. Kent.

A Chilled Blast Furnace Hearth. James Gayley.

Peculiar Phenomena in the Heating of Open Hearth and Bessemer Steel. William Garrett.

Mitis-Castings from Wrought-Iron or Steel. Peter Ostberg.

Notes on the Construction of Cast-Iron. C. B. Dudley and F. N. Pease.

Proposed Apparatus for Determining the Heating Powers of Different Fuels. Wm. Kent.

Note on the Determination of Small Quantities of Titanium in Irons and Steels. Horace L. Wells.

A New Method of Laying Submarine Tunnels and Tubes. Richard P. Rothwell.

The Specific Gravity of Low Carbon Steel. George S. Miller.

Note on a Cupel Machine. Prof. Charles E. Wait.

The Geology of the Pittsburgh Coal Region. J. P. Lesley.

Note on the Use of Gasoline-Gas in a Chemical Laboratory. Prof. Charles E. Wait.

Note on the Reduction of Ferric Solutions by the Use of Amalgamated Zinc and Platinum Foil. Alfred L. Beebe.

The Mining Compass and Trigonometer. Erich G. Gaertner.

Iron Ore Deposits of Southern Utah. W. P. Blake.

The Heine Safety Boiler. E. D. Meier.

The Manufacture of Fire-Brick at Mount Savage, Maryland. Robert Anderson Cook.

Biographical Notice of Oswald J. Heinrich. R. W. Raymond.

Geology of the Low Moor, Virginia, Iron Ores. Benj. Smith Lyman.

Pittsburgh and Vicinity—A Brief Record of Seven Years' Progress William P. Shinn.

From William S. Auchincloss, Philadelphia, Penn.:

Die practische Anwendung der Schieber-und Coulissensteurungen.

From James Barrowman, Secretary, Mining Institute of Scotland, Hamilton:

Transactions of the Mining Institute of Scotland. Vol. VII. Part 8.

From Gen. S. V. Benét, Chief of Ordnance, Washington, D. C.:

Annual Report of the Chief of Ordnance to the Secretary of War for the fiscal year ended June 30, 1885.

From H. Bissell, Salem, Mass.:

Merchandise Tariff of the Boston and Maine Railroad Leased Lines and Branches, adopted by the Directors January 21, 1885. To take effect February 1, 1885.

From Wm. H. Brown, Philadelphia, Penn.:

Record of Transportation Lines owned and operated by and associated in interest with the Pennsylvania Railroad, for the year ending December 31, 1885.

From C. H. Bunce, Hartford, Conn.:

Fourteenth Annual Report of the Board of Street Commissioners of the City of Hartford, for the year ending December 31, 1885.

From Bureau of Education, Washington, D. C.:

Report of the Commissioner of Education for the year 1883–84.

Circulars of information of the Bureau of Education, Nos. 3 and 4, 1885.

From Bureau of Navigation, Navy Department, Washington, D. C.:

Pilot Chart of the North Atlantic Ocean for the month of March and April, 1886.

From Bureau of Statistics, Washington, D. C.:

Statistical Abstract of the United States for 1885. Seventh and Eighth numbers.

From California Academy of Science, San Francisco, Cal.:

Bulletin of the California Academy of Science. No. 4. January, 1886.

From Thomas C. Chamberlain, Washington, D. C.:

The Requisite and Qualifying Condition of Artesian Wells.

From George H. Cook, New Brunswick, N. J.:

Annual Report of the State Geologist for the year 1885.

Atlas sheets Nos. 1, 9, 13 and 17 of the Geological Survey of New Jersey.

From Elmer L. Corthell, New York City:

An Exposition of the Errors and Fallacies in Rear-Admiral Ammen's Pamphlet, April, 1886.

Statement of Mr. Elmer L. Corthell before the Sub-Committee of the Committee on Commerce of the House of Representatives, in reference to the Commercial and other Advantages of the Ship Railway at the Isthmus of Tehuantepec in Mexico, February 5, 1886.

From Martin Coryell, Lambertville, N. J.:

Ninth Annual Report of the Directors of the Lambertville Water Company, March 11, 1886.

From William Cowles, New York City:

Improvement in Ferry Boats.

From Dawson Brothers, Publishers, Montreal, Canada:

The Manufacture, Consumption and Production of Iron, Steel and Coal in the Dominion of Canada.

From Frank C. Doran, Richmond, Ind.:

Five Photographs of the Three-hinged Wrought-Iron Arch Bridge, at Richmond, Indiana.

From Edward Bates Dorsey, London, England:

Three sample maps, Ordnance Survey of portions of England

Annual Statistical Report of the Secretary to the Members of the British Iron Trade Association on the Home and Foreign Iron and Steel Industries in 1884.

Whitaker's Almanack for 1886.

Fifty-sixth to Fifty-ninth Annual Reports of the President and Directors of the Baltimore and Ohio Railroad Co., for the year ended 30th September, 1882 to 1885.

A paper read before the Chesterfield and Derbyshire Institute of Engineers on Brunton's Heading Machine. William Johnson.

Report of Mr. Joseph Parry, C. E., on the Present Drought and on Possible Savings in the Consumption of Water, stated 13th July, 1885, City of Liverpool, Eng.

Report of Mr. George F. Deacon, C. E., as to the Vyrnwy Masonry Dam, City of Liverpool, England.

Various Time-tables of Railroads throughout England.

From Henry Drisler, Secretary Astor Library, New York City:

Thirty-seventh Annual Report of the Trustees of the Astor Library, for the year 1885.

From Pat Doyle, Black Town, Madras, India:

The Indian Coal Mines.

The first number of the *Indian Engineer*, Calcutta.

Coal Mining by Blasting in the Bengal Coal Field.

From James B. Eads, New York City:

Discussion on the paper of E. L. Corthell on the South Pass Jetties.

From Engineers' Society of Western Pennsylvania. S. M. Wickersham, Secretary, Pittsburgh:

Long Distance Transportation of Natural Gas.

From George E. Evans, Lowell, Mass.:

Thirteenth Annual Report of the Lowell Water Board. January 12, 1886.

From Avv. Cav. Maggiorino Ferraris, Segretario della Commissione d'inchiesta per la Revisione della Tariffa Doganale, Rome, Italy:

Atti della Commissione d'inchiesta per la Revisione della Tariffa Doganale. I Parte, Agraria.

From P. J. Flynn, East Oakland, Cal.

Kutter's Formula.

From Franklin Institute, Philadelphia, Penn.:

Reports of the Examiners of Section XI. Steam Engines.

Report of the Examiners of Section XXII. Supplementary Report on Meteorological and other Registers.

Report of Examiners of Section XXIX: "Educational Apparatus," with which is incorporated Section XIII: "Apparatus for High Electro-Motive Force."

From George H. Frost, New York City:

New Ordnance Material. William H. Bixby.

From E. A. Fuertes, Ithaca, N. Y.:

Catalogue of Engineers Graduated from Cornell University, Ithaca, N. Y., 1869–85.

From G. K. Gilbert:

Studien über die Gestaltung der Sandküsten und der Anlage von Seehäfen im Sandgebiet, von H. Keller.

From B. M. Harrod, New Orleans, La.:

Caving Banks on the Mississippi River. B. M. Harrod, C. E.

From Albert B. Hill, New Haven, Conn.:

Annual Report of the Department of the Board of Public Works, City of New Haven, Conn., for the year 1885.

From Ingersoll Rock Drill Co., New York City:

Views, Description and Progress of Work on the New Croton Aqueduct Tunnel, New York City, March, 1886.

From Institution of Civil Engineers, James Forrest, Secretary, London:

Proceedings, Vol. LXXXIII., 1885–86, Pt I.

On Construction in Earthquake Countries. John Milne. With an abstract of the discussion upon the paper.

On the Theory of the Steam Engine Indicator and the Errors in Indicator Diagrams. Osborne Reynolds.

Experiments on the Steam Engine Indicator. Arthur William Brightmore. With an abstract of the discussion upon the papers.

High-Speed Motors. John Imray.

Continuous Current Dynamo-Electric Machines and their Engines. Gisbert Kapp. With an abstract of the discussion upon the papers.

From Institution of Mechanical Engineers, Walter R. Brown, Secretary, London:

General Index to Proceedings, 1874–84.

From Improvement Association, Passaic, N. J.:

Passaic City, New Jersey, and its Advantages as a Place of Residence and as a Manufacturing Center.

From Iron and Steel Institute, J. S. Jeans, Secretary, London:

The Journal of the Iron and Steel Institute, No. 2, 1885.

From William Jackson, Boston:

Nineteenth Annual Report of the City Engineers of Boston, Mass., for the year 1885.

From Wm A. Jefferis, New York City:

Atlantic City as a Winter Resort.

From J. Francis Le Baron, Jacksonville, Fla.:

A Description of the History, Industries, Churches, Schools, Hotels, Hospitals and other Institutions, etc., of Jacksonville, Florida. By James Esgate.

Peninsular and Sub-Peninsular Air and Climate. W. C. Van Bibler, M. D.

A Hand-book of Important and Reliable Information for the use of the Tourist, Settler and Inventor in Florida. John P. Varnum.

From Liverpool Engineering Society, Thomas L. Miller, Secretary, Liverpool, England:

Annual Report of the Liverpool Engineering Society for 1885.

From Major G. J. Lydecker, Engineer-Commissioner, Washington, D. C.:

Annual Report of the Operations of the Engineer Department of the District of Columbia, for the year ending June 30, 1885.

From R. K. Martin, Baltimore, Md.:

Annual Report of the Water Department of the City of Baltimore, Md., for the fiscal year ending December 31, 1885.

From Theodore H. McKenzie, Southington, Conn.:

Report of the Secretary and Engineer of the Southington Water Company on the Construction of the Water-works, Southington, Conn., December, 1885.

From the Mining Institute of Scotland, James Barrowman, Secretary, Hamilton:

Report relative to the Mining Exhibition held in Glasgow under the auspices of the Mining Institute of Scotland, September, 1885.

From Gen John Newton, Chief of Engineers U. S. A., Washington, D. C.:

Report of a Survey and Examination of Pascagoula River, Mississippi.

Report of an examination of Wacissa River, Florida.

Report from the Chief of Engineers in relation to Senate Bill 753, for the Sale of Fort Brady, Michigan.

Reports of Examination and Survey with a view of connecting Saugatuck River with Long Island Sound.

Report of a Survey of Saco River, Maine.

Report asking an Appropriation for Increasing the Water Supply of Washington, D.C.

Report of a Survey and of a Preliminary Examination of Muskingum River, Ohio.

Report of an Examination and Survey by Capt. H. S. Taber, Corps of Engineers, of Arkansas River, from Fort Gibson to Wichita, Kansas.

Report Recommending Legislation to Enforce Regulations concerning the Passage of Vessels through the South Pass, Mississippi River.

Tables of Geographic Positions, Azimuths, and Distances, etc.

In regard to the Improvement of Santee River, South Carolina.

In regard to Damage by Storms to Sea Wall in Boston Harbor.

A draft of a bill to Regulate the Use of Public Parks in the District of Columbia, and recommending its passage.

Report of additional surveys by Maj. Thomas H. Handbury, of routes for Hennepin Canal.

Report relative to the Government Pier on Delaware Bay.

Reports and maps showing encroachments of the Missouri River upon the Military Reservation at Fort Leavenworth, Kan.

Report in response to a resolution relative to the proposed purchase of the Franchise of the Green and Barren River Navigation Company by the United States.

Statement showing rank, duties, and addresses of the Officers of the Corps of Engineers, April 1, 1886.

Report upon the Improvement of the Entrance to Galveston Harbor.

Report recommending that Improvements be made in the Lockage of Saint Mary's Falls Canal.

From New York State Board of Health, Albany:

Bulletin of the State Board of Health for January and February, 1886.

From E. P. North, New York City:

One photograph of the Grand Central Depot, New York, Incoming Trains Depot.

From W. Osborne, Pillintzer Strasse, Dresden:

An Address to the Public in regard to the new 24-hour Clock.

From Park Commissioners, Boston:

Notes on the plan of Franklin Park, Boston, Mass., and relative matters.

From Ralph W. Pope, Secretary Am. Inst. Electrical Engineers, New York City:

Rules of the American Institute of Electrical Engineers, amended December 8th, 1885.

From Thomas Russell, Chairman Board of Railroad Commissioners, Boston:

Seventeenth Annual Report of the Board of Railroad Commissioners of Massachusetts for the year 1885.

From Collingwood Schreiber, Ottawa, Canada:

Annual Report of the Minister of Railways and Canals for the fiscal year, from 1st July, 1884, to 30th June, 1885, on the works under his control.

From Charles P. Shaw, New York City:

Argument of Robert Sewell, Engr., on behalf of the New York Cable Railway Co., before the Mayor of New York, 9th March, 1886.

From T. Guilford Smith, Buffalo, N.Y.:

Annual Report of the City Engineer, Buffalo, N. Y., for the year 1885.

Report of the Receivers of the P. and R. R. Co., and the P. and R. Coal and Iron Co., of the operations for the year ending November 30th, 1885.

From D. McN. Stauffer, New York City:

Proceedings of the Michigan Engineering Society at its Sixth Annual Convention, held at Lansing, February 17th, 18th, 19th and 20th, 1885.

On Tidal Theory and Tidal Predictions. E. A. Gieseler.

Report of the Governor of Washington Territory for the year 1884.

Report of the Trustees of the Sanitary Improvement Bonds of the City of Jacksonville, Fla., July 1st, 1884, to July 1st, 1885.

Speech of William L. Scott on the subject of the Coinage of the Standard Silver Dollar.

Topographical Models: their Construction and Uses. A. E. Lehman.

First Annual Report of the City Engineer of the City of Des Moines, for the year 1885.

River Transportation and the Muscle Shoals Canal. Major W. R. King.

Report of the Railroad Commissioners of the State of Maine for the year 1885.

The Cowles Electric Furnace and the Productions of Aluminium and its Alloys. Alfred H. Cowles.

Annual Report upon the Improvement of Harbors and Rivers on the Southern Coast of Massachusetts, and in Rhode Island and Connecticut.

Obituary Number of the *South Pennsylvania Transit*, Vol. II, No. 1. November, 1885.

Statistics of Coal in Illinois for the year 1885.

Report, with Plans and Estimates, for the Sewerage and Drainage of Orange, N. J.

A Summary of the Third Annual Report of the Bureau of Statistics of Labor of the State of New York for the year ending January 21st, 1886.

Annual Report of the Board of Managers of the New York State Reformatory at Elmira for the year ending September 30th, 1885.

Report to the Board of Trustees upon the Drainage and Sewerage for the Town of Lake, Ill. October, 1885.

Second Annual Report of the Board of Water Commissioners to the City of Northampton, Mass., for the year ending November 30th, 1885.

Report of the Board of Public Works of the City of Grand Rapids, Mich., for the fiscal year ending April 30th, 1885.

First Report of the Water Department of the Town of Wellesley from the beginning of the works, April, 1884, to July 1st, 1885.

The Twentieth and Twenty-first Annual Reports of the Cambridge Water Board for the years 1884 and 1885.

Tenth Annual Report of the Water Commissioners of the City of Taunton, Mass. November 30th, 1885.

Fourteenth Annual Report of the Superintendent of Water-works, Bay City, Michigan, for the year 1885.

Tenth Annual Report of the Lawrence, Mass., Water Board for the year 1885.

Report of the Board of Water Commissioners of the City of Middletown, Conn., for the years 1884 and 1885.

Twelfth Annual Report of the Board of Water Commissioners of the City of Springfield, Mass., for the year 1885.

Annual Report of the City Engineer of the City of Cambridge, Mass., for the year ending November 30th, 1885.

Third Annual Report of the Board of Water Commissioners of the City of Madison, Wis., for the year ending October 1st, 1885.

Report of the Consulting Engineers on Examination of the Sewerage System of the City of Newport, R. I. November 27th, 1885.

First Annual Report of the Board of Public Works of the City of East Saginaw, Mich., for the fiscal year ending January 5th, 1886.

Eleventh Annual Report of the Water Commissioners of the City of Allentown, Penn., for year ending December 31st, 1885.

Annual Report of the Board of Water Commissioners of the City of Binghamton, State of New York, for the year ending December 31st, 1885.

Fourteenth Annual Report of the Public Water Board of the City of Lynn, Mass., for the year ending December 31st, 1885.

Fourth Annual Report of the Board of Water Commissioners of the City of St. Paul, Minn., December 1st, 1885.

Sixteenth Annual Report of the New Bedford Water Board of the City of New Bedford, Mass., December 31st, 1885.

Annual Reports of the Committee on Water, the Water Commissioners, the Water Registrar and the City Engineer of the City of Worcester, Mass., for the year ending November 30th, 1885.

Annual Reports of the Department of the Board of Public Work, City of New Haven, Conn., for the year 1885.

General Buell's Map of the Battle-field of Shiloh.

An Analysis of the Laws of Motion: their relation to bodies moving in resisting media, and to various modes of steamship propulsion. John Giles.

Annual Accounts and Statements, with Superintendent's and Auditor's Reports, of the Sewerage and Water Supply for the City of Saint John (East Side) and Town of Portland, N. B., for the year ending December 31st, 1884.

Bound Pamphlets on Canals and Railroads, etc.

Annual Report of the Chief Engineer of the Water Department of the City of Philadelphia for the year 1872.

The Practice of the Improvement of the Non-Tidal Rivers of the United States, with an Examination of the Results thereof, by Captain E. H. Ruffner, Corps of Engineers, U. S. A.

From Lucian A. Taylor, Worcester, Mass.:

Annual Reports of the Committee on Water, the Water Commissioner, the Water Registrar and the City Engineer of the City of Worcester, for the year ending November 30th, 1885.

From J. Nelson Tubbs, Rochester, N. Y.:

Proceedings to acquire Water Rights by the City of Rochester, N. Y. Vos. I and II.

From United States Naval Institute, Annapolis, Md:

Proceedings, Vol. XII, No. 1.

From United States Geological Survey, Washington, D. C.:

Fifth Annual Report of the United States Geological Survey, 1883–84.

27 maps U. S. Geological Survey.

From Edmund B. Weston, Providence, R. I.:

Annual Report of the Commissioner of Dams and Reservoirs made to his Excellency, Augustus O. Brown, Governor, January 1, 1885.

The Distribution of Rainfall in New England February 10th-14th, 1886, from Observations reported to the New England Meteorological Society. Wilson Upton.

Bulletin of the New England Meteorological Society for February, 1886.

From C. J. H. Woodbury, Boston Mass.:

An Address before the National Electric Light Association, Baltimore, Md., on the Relation of Electric Lighting to Insurance.

Second Report on Automatic Sprinklers.

From Stephen M. Wright, Secretary General Society of Mechanics and Tradesmen, New York City:

One Hundredth Annual Report of the General Society of Mechanics and Tradesmen of the City of New York, 1886.

From Charles G. Yale, Secretary Technical Society of the Pacific Coast, San Francisco, Cal.:

Transactions for October, November and December, 1885, and January and February, 1886.

From other sources:

Ransome's Concrete Construction.

Opinions of the Press on the Effect on City and State Credit.

Hand-book and Illustrated Catalogue of the Engineers' and Surveyors' Instruments made by Buff & Berger.

An Address delivered before the New York Academy of Sciences November 23d, 1885, by R. M. Caffall, on his Process for Water-proofing and Preserving Buildings, as recently applied to the Obelisk in Central Park.

Proposals, Contracts and Specifications for Furnishing Vitrified Salt - Glazed Clay Water-pipe for Little Falls, N. Y., Waterworks.

Pamphlet of the Carolina Oil and Creosote Company on the Manufacture of Carbonized and Wood-Creosoted Timber and Cross-Ties, and Wood-Creosote Oil.

LIST OF MEMBERS.

ADDITIONS.

MEMBERS.		Date of Election.
Elmer, Howard Nixon	St. Paul, Minn	April 7, 1886.
Raymond, Charles Ward	(Elected Junior November 7, 1877) Care Sooysmith & Co., 52 Montauk Block, Chicago, Ill	" " "
Thackray, George Edward	(Elected Junior September 6, 1882), Box 117, Sharpsburg, Pa.	" " "
Varona, Ignacio Maria de	223 East 31st street, New York City	" " "
ASSOCIATES.		
Dana, James Jackson	140 Pearl street, New York City	" " "
Phillips, Henry Ayling	Division Superintendent Fitchburg R. R., Worcester, Mass.	" " "
JUNIORS.		
Barlow, John Quincy	Northern Pacific R. R., Ellensburg, Wash. Territory	" " "
Downes, Stancliff Bazen	1071 Madison Avenue, New York City	" " "
Ricker, George Alfred	53 Twelfth street, Buffalo, N. Y.	" " "
Shepard, William Tuttle	18 City Hall, New Haven, Conn.	" " "
Tratman, Edward Ernest Russell	170 Clinton street, Brooklyn, N. Y.	" " "

CHANGES AND CORRECTIONS.

MEMBERS.

ATWOOD, WILLIAM H.....Astoria, Queens Co., N. Y.
BELL, HENRY P.....Esquimault and Nanaimo R'y, Cowichan, British Columbia.
BROOKS, FRED.....31 Milk street, Boston, Mass.
CLEMENT, FRANK H.....Civil Engineer and Contractor, Ardsley, N. Y.
CLARKE, ELIOT C.....15 Brimmer st., Boston, Mass.
CUNNINGHAM, DAVID W.....Grandin, Cass Co., Dakota.
ENDICOTT, MORDECAI T.....Civil Engineer U. S. N., U. S. Navy Yard, Norfolk, Va.
FALCONET, EUGENE F.....Engineer Ætna Iron Co., Nashville, Tenn.
FILLEY, HIEL H.....Chief Engineer Southern General Division Mexican National R'y, Mexico, Mexico.
HEMBERLE, EDWARD.....14 Douglas st., Karlsruhe, Baden, Germany.
LINVILLE, JACOB H.....3924 Walnut st., West Philadelphia, Pa.
MCCOLLOM, THOMAS C.....Civil Engineer U. S. N., League Island, Pa.
ORBISON, THOMAS W.....Appleton, Wis.
PARKHURST, HENRY W.....Bristol, R. I.
PEGRAM, GEORGE H.....9 South st., New York City.
POU, ARTHUR.....Chief Engineer Savannah, Dublin and Western Short Line R'y, Savannah, Ga.
PRATT, WILLIAM A.....Weston, Lewis Co., West Va.
PRINDLE, FRANKLIN C.....Civil Engineer U. S. N., East Orange, N. J.
PURDON, CHARLES D.....Paris and Great Northern R'y, Paris, Texas.
SAFFORD, EDWARD S.....Arlington, Mass.
SEARS, ALFRED F.....Helena, Montana.
STAATS, ROBERT P.....171 Broadway, New York City.
WALKER, JOHN S.....Box 45, Texarkana, Texas.
WILDER, FRANCIS M.....Binghamton, N. Y.

JUNIORS.

BLANC, FREDERICK N.....14 West 23d st., New York City.
BOOKER, BERNARD F.....Lock-Box 6, Keokuk, Iowa.
BREITHAUPT, WILLIAM H.....4 Lockridge Hall, S.E. Corner Main and Fifth sts., Kansas City, Mo.
CARRÈRE, J. MAXWELL.....466 Henry st., Brooklyn, N. Y.
FULLER, WILLIAM B.....4 Bunnell Block, Duluth, Minn.
GAY, MARTIN.....West New Brighton, Richmond Co., N. Y.
GOLDMARK, HENRY.....32 Liberty st., Room 11, New York City.
SMITH, MAXWELL.....109 East 72d st., New York City.

DEATH.

BAILEY, THOMAS NORTON.....Elected Member November 7th, 1883; died April 20th, 1886.

American Society of Civil Engineers.

PROCEEDINGS.

Vol XII.—May, 1886.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

MAY 5TH, 1886.—The Society met at 20 o'clock, Vice-President Thomas F. Rowland, in the chair; John Bogart, Secretary. The following candidates were elected as Members: Almon Byron Atwater, Detroit, Mich.; Frederick Eaton, Los Angeles, Cal.; Eugene Frederick Fuller, Paducah, Ky.; Albert Mather Smith, New York City; Charles Sooysmith, New York City; Augustine Washington Wright, Chicago, Ill. As Junior; John Jacob Hopper, New York City.

The election as Fellow of the Society of Amzi Lorenzo Barber, of Washington, D. C., was announced.

The death of Capt. Thomas Norton Bailey, M. Am. Soc. C. E., Corps of Engineers, U. S. A., on April 20th, 1886, was announced.

The report of the committee appointed to place before the General Railway Time Convention the information gathered by the Society in regard to Standard Time, was read, stating that the Time Convention had appointed a special committee on the subject. The report was accepted and the committee discharged.

The paper previously presented on "English and American Railroads Compared," by Edward Bates Dorsey, M. Am. Soc. C. E., was discussed by Messrs. G. Bouscaren, J. Henney, Jr., Edward Pritchard, M. Inst. C. E., R. L. Harris, and Dorsey.

Blue prints of two heavy locomotives now in use by the Southern Pacific Co., Pacific System were presented by Mr. A. J. Stevens, Master Mechanic, through R. L. Harris, M. Am Soc. C. E., and the thanks of the Society were tendered to Mr. Stevens for these drawings and the accompanying information.

MAY 19TH, 1886.—The Society met at 20 o'clock, Vice-President Thomas F. Rowland, in the chair; John Bogart, Secretary.

The death of James D. Burr, M. Am. Soc. C. E., on May 7th, 1886, was announced.

The paper previously presented on "Errors in Railroad Levels," by H. V. Hinckley, M. Am. Soc. C. E., was discussed by L. L. Wheeler, M. Am. Soc. C. E.

A paper by Capt. O. E. Michaelis, M. Am. Soc. C. E., Corps of Ordnance, U. S. A., "A Note on the Cost of Concrete" was read.

MEMOIRS OF DECEASED MEMBERS.

THOMAS SYDENHAM HARDEE, M. Am. Soc. C. E.

DIED MAY 20TH, 1880.

Thomas Sydenham Hardee was born in Liberty County, Ga., in the year 1832. His father was a physician of that place. He was named after Thomas Sydenham, a celebrated English physician. He graduated from the University of Georgia at the age of eighteen and was then offered the choice of an education as a civil engineer or of a thorough training in Italy in music, as he had at a very early period developed remarkable musical tastes. He however preferred the technical education and became a student at West Point, taking a special course under the instruction of Prof. Mahan. After the completion of his studies he became engaged upon the location of the New Orleans and Great Northern Railroad, and was in active service upon that and other railroads for about ten years.

At the commencement of the war he entered the Confederate service as Captain of Engineers, and was upon the staff of his uncle, General W. J. Hardee, becoming afterwards Lieutenant-Colonel of Engineers in that service. He was actively engaged in engineering duties during the war, being for a part of the time also upon the staff of General Joseph E. Johnston, and won many commendations for gallantry, skill and coolness.

Afterwards he was special engineer and member of the Railroad Board of Inspection of the State of Mississippi. In 1870 he went to New Orleans and prepared for the State a very valuable map of Louisiana. In 1874 he became the City Surveyor of New Orleans, and gave careful attention to the problem of the drainage of that city, which was at that

time in a deplorable condition, the various districts of the city having separate systems for the disposal of their drainage. He recommended that, before any additional work should be undertaken, a thorough topographical survey of the city should be made and a general plan of drainage determined upon to be carried out through a series of years. He prepared and recommended a plan for this purpose which involved an expenditure of a very much less amount of money than would have been expended had the plans previously considered for this purpose been carried out. The financial condition of the city, however, was such, that it was deemed impossible at that time to carry out any proper plan of drainage. A plan of his for securing a better and more wholesome supply of water to the city was also given up on account of financial difficulties.

In 1876 he was elected Chief Engineer of the Louisiana Levee Company, and afterwards was made Assistant-Engineer of the State, and, on the resignation of Major B. M. Harrod, M. Am. Soc. C. E., he became Chief Engineer of the State of Louisiana. In this position he had charge of the construction of the levees of the State. He constructed the works of repair at the great break at Bonnet Carré, and also the break in the Sharp Levee opposite the City of New Orleans, where he exposed himself while suffering from illness and never recovered from the effects of that exposure.

Colonel Hardee was one of the most trusted engineers in the South. He added to a thorough technical education, very great industry and zeal in the practical works of his profession.

In 1861 Colonel Hardee married Miss Harriot Zacharie, and his widow and six sons survive him. He was elected a Member of the American Society of Civil Engineers April 4th, 1877.

LIST OF MEMBERS.

ADDITIONS.

MEMBERS.

		Date of Election
JOHNSON, JOHN BUTLER	Washington University, St. Louis, Mo.	April 7, 1886.
RUGGLES, WILLIAM BURROUGHS	Chief Engineer Ohio and Mississippi Ry., Cincinnati, Ohio	April 7, 1886.
SMITH, ALBERT MATHER	Consolidated Gas Co., Tenth ave. and 18th st., New York City	May 5, 1886.
SOOYSMITH, CHARLES	2 Nassau st., New York City,	May 5, 1886.

WRIGHT, AUGUSTINE WASHINGTON..185 Dearborn st. (Room 7), Chicago, Ill..... May 5, 1886.

ASSOCIATES.

BOGART, SAMUEL STOCKTON.....Superintendent Telegraphs and Signals, West Shore R. R., foot West 42d st., New York City ..... April 7, 1886.

YOUNG, FREDERICK STAFFORD .....350 Broadway, Troy, N. Y.. April 7, 1886.

JUNIORS.

DONOVAN, JOHN JOSEPH .....Northern Pacific R. R., Ellensburgh, Wash..... April 7, 1886.

TITUS, WALTON OBADIAH..... P. O. Box 109, Eagle Pass, Texas..... April 7, 1886.

FELLOW.

BARBER, AMZI LORENZO.....280 Broadway, New York City..... March 19, 1886.

CHANGES AND CORRECTIONS.

MEMBERS.

ATWOOD, WILLIAM H..... ....Chatham, Mass.

BAKER, WILLIAM H..... .....Fitchburg, Mass.

DRAKE, WILLIAM A..... ...Resident Engineer, Atchison, Topeka and Santa Fé R. R., Topeka, Kansas.

FANNING, JOHN T.....Chief Engineer St. Anthony's Falls Water Power Co., Union Depot, Minneapolis, Minn.

GATES, HORACE D..... .....2800 Pine st., San Francisco, Cal.

GOAD, CHARLES E.....102 St. Francis Xavier st., Montreal, Canada.

HENNING, CHARLES S.....Cherokee, Kansas.

HOFF, OLAF.....25 and 26 Tribune Building, Minneapolis, Minn.

MCGRATH, WALLACE.....Care Chief Engineer Atchison, Topeka and Santa Fé R. R., Topeka, Kansas.

NEILSON, CHARLES..... .....General Superintendent Cincinnati, Hamilton and Dayton R. R., Cincinnati, Ohio.

SEARS, CLINTON B.....Captain Corps of Engineers, U. S. A., University Club, New York City.

THACKRAY, GEORGE E.....Box 789, New York City.

VAN BROCKLIN, MARTIN..... .....Care Messrs. R. Towns & Co., Sydney, Australia.

JUNIORS.

EMONTS, WILLIAM A. G..... .....(Care C. H. Kellogg), 24 Erie st., Buffalo, N. Y.

FRANCIS, GEORGE B.....Assistant Engineer New Jersey Junction R. R., 173 Bergen ave., Jersey City, N. J.
HASKINS, WILLIAM J.....537 West 105th st., New York City.
SHEPARD, WILLIAM T.....(Care N. C. Ray, Assistant Engineer Union Pacific Ry.), Anaconda, Montana.

DEATH.

BURR, JAMES D.....Elected Member April 5, 1876; died May 7th, 1886.

CONTRIBUTIONS TO THE BUILDING FUND.

By a resolution of the Board of Direction, all contributions to the Building Fund are to be acknowledged, from time to time, by printing lists of the same in the monthly Proceedings of the Society, and in addition to this, the names of all those who may subscribe $100 or more are to be regularly enrolled and published in future lists of the Society under the head of Subscribers to the Building Fund, and they will be entitled to receive one copy of the monthly publications, comprising all papers and Transactions of the Society, regularly for life, for each $100 subscribed by them; such copies to be in addition to those which they may be already entitled to if they are Members or Fellows.

The following contribution is acknowledged in addition to those heretofore noted:

Frederic Graff.....$200.00

THE ROWLAND PRIZE.

CODE OF RULES FOR ITS AWARD.

Not more than one prize shall be awarded each year for papers presented during the year. The year shall terminate on the first day of August, and the award shall be announced at the annual meeting in January.

The prize shall consist of fifty dollars in cash.

The award shall be made by a committee consisting of the Secretary and two Members of the Society, to be appointed by the Board of Direction.

The prize shall be awarded to such paper as the committee deem most worthy of such recognition, the preference being given to papers describing in detail accomplished works of construction, their cost and manner of execution, and the errors in design and execution.

THE NORMAN MEDAL.

CODE OF RULES FOR ITS AWARD.

I.—Competition for the Norman Medal of the American Society of Civil Engineers shall be restricted to Members of the Society.

II.—There shall be one gold medal, and only one, struck for each and every fiscal year of the Society, and awarded as hereinafter provided. The dies therefor shall be with the Superintendent of the United States Mint at Philadelphia, in trust exclusively for the above purpose. Such medal shall be of a cost equal to the annual interest received upon $1 000 of the Consolidated Stock of the City of New York, Certificate No. 179, of the additional new Croton Aqueduct Stock of the City of New York, authorized by an Act of the Legislature of the State of New York, Chap. 230, passed April 15th, 1870, dated November 17th, 1873, now held in trust by the Treasurer of this Society, and so held solely for this purpose, and shall be executed upon his order.

III.—All original papers presented to the Society by Members of any class, during the year for which the medal is awarded, shall be open to the award, provided that such papers shall not have been previously contributed in whole or in part to any other association, nor have appeared in print prior to their publication by the Society, nor have been presented to the Society in any previous year.

IV.—The Board of Censors to award the medal shall consist of three Members of the Society, to be designated by the Board of Direction. The Secretary of the Society shall act as Secretary to the Board of Censors.

V.—The medal shall be awarded to such paper as the said Board shall judge to be worthy of special commendation for its merits as a contribution to engineering science, not merely relatively as compared with others presented during the same year, but as exhibiting the science, talent or industry displayed in the consideration of the subject treated of, and for the good which may be expected to result from the discussion and the inquiry.

VI.—In case no paper presented during the year shall be deemed of sufficient value to receive an award, the amount of the interest of the fund for that year shall be expended by the Board of Direction in the purchase of books, to be offered as a premium for the second best paper in the next year in which more than one paper of sufficient value may be presented.

VII.—The medal year shall terminate on the first day of August, and the award shall be announced at the annual meeting.

VIII.—The Treasurer of this Society shall cause the medal to be prepared and delivered to, or deposited to the order of, the successful competitor, within two months after the annual meeting at which the same shall have been awarded.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. XII.—June, 1886.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

JUNE 2D, 1886.—The Society met at 20 o'clock, Past President George S. Greene in the chair; John Bogart, Secretary. The following candidates were declared elected. As Members: William Algernon Brackenridge, Brooklyn, N. Y.; Robert Gillham, Kansas City, Mo.; Arthur Henshaw Howland, Boston, Mass.; Richard Leveridge Hoxie, Montgomery, Ala.; Herbert Sherman Huson, North Yakima, Wash. Ter.; Charles Edward Jackson, New York City; William Henry Lawton, Jr., Newport, R. I.; Samuel Bingham McKee, Montreal, Canada; Charles Henry Sawyer, Stanberry, Mo.; John Stewart Schaeffer, Newark, N. J.; Addison Moffat Scott, Charleston, West Va.; John Findley Wallace, Keithsburg, Ill. As Associate: Calvin Milton Woodward, St. Louis, Mo. As Juniors: Samuel Eben Barney, Jr., New Haven, Conn; Charles Pierre Bonnett, Elizabeth, N. J.; Nathaniel Oliver Goldsmith, Glendale, Ohio; Charles Malon Mills, New York City; Henry Bowman Seaman, Brooklyn, N. Y.

The election as Fellow of the Society of John Joseph Albright, of Buffalo, N. Y., was announced.

A paper by Palmer C. Ricketts, Assoc. Am. Soc. C. E., "Some Constants of Structural Steel," was read and discussed.

A model of an apparatus for climbing chimneys, for purposes of construction and repair, was exhibited by Mr. Arthur Westcott, of Liverpool, England.

LIST OF MEMBERS.

ADDITION.

FELLOW.	Date of Election.
ALBRIGHT, JOHN JOSEPH.....Buffalo, N. Y.....	April 20, 1886.

CHANGES AND CORRECTIONS.

MEMBERS.

BRINCKERHOFF, HENRY W.....41 Jefferson avenue, Brooklyn, N. Y.
CHILDS, JAMES E.....General Manager New York, Ontario and Western R. R., 16 Exchange Place, New York City.
CRAVEN, HENRY S.....Civil Engineer, U. S. N., Kittery Point, Me.
DAVIS, CHARLES E. L. B.....Captain Corps of Engineers, U. S. A., P. O. Drawer 7, Milwaukee, Wis.
DOANE, WALTER A.....(Care Lewis Kingman, Asst. Chief Engineer Atchison, Topeka and Santa Fé R. R.), Topeka, Kan.
DRAKE, WILLIAM A.....Resident Engineer Atchison, Topeka and Santa Fé R. R., Topeka, Kansas.
FLAGG, J. FOSTER.....Division Engineer New York Steam Co., 21 Cortlandt st., New York City.
GATES, CHRISTOPHER L.....Engineer Smith Bridge Co., Toledo, Ohio.
GRANT, WILLIAM H.....209 West 55th st., New York City.
PARTRIDGE, JOHN A.....627 F st., N. W., Washington, D. C.
WHEELER, LEVI L.....P. O. Box 1073, Jackson, Mich.

JUNIORS.

BENSEL, JOHN A.....64 E. 79th st., New York City.
LUCAS, D. JONES.....Port Jervis, N. Y.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. XII.—July, 1886.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

ANNUAL CONVENTION OF THE SOCIETY,

HELD AT DENVER, COLO., JULY 2D, 3D, 5TH AND 7TH, 1886.

FIRST SESSION.

FRIDAY, JULY 2D, AFTERNOON.—The Convention assembled in the hall of the Chamber of Commerce, and was called to order at 15:15 o'clock by Mr. JOHN BOGART, the Secretary of the Society, who said:

I have the honor of calling the Colorado Convention of 1886, of the American Society of Civil Engineers, to order, and I have the pleasure of introducing to the Society its President, Colonel HENRY FLAD.

President FLAD.—Gentlemen: Under the By-Laws of the Society, a Chairman selected from Members, not officers, is to preside over all but business meetings of the Convention. If the Local Committee is ready to make a nomination, we will be glad to hear from them.

Mr. GEORGE S. RICE, M. Am. Soc. C. E.—I nominate for Chairman, Mr. Robert B. Stanton, of Denver.

The nomination of Mr. Stanton was carried, and that gentleman took the chair.

Mr. ROBERT B. STANTON, M. Am. Soc. C. E.—Gentlemen: It is hardly necessary for me to say that I appreciate the honor you have conferred on me in appointing me to this position, being so young a Member of our Society, and I have only to say, that as we, Members of this Society in

Denver, are so few—only two—we doubly welcome you to our State. In accordance with the usual custom at conventions, Past Presidents of the Society are invited to occupy seats upon the platform.

The Secretary then made announcements in regard to the meetings. He also presented the following letter:

To the President and Members of the American Society of Civil Engineers now in Session at the Chamber of Commerce.

The Executive Committee in charge of the celebration of the Fourth of July, 1886, will be honored by your presence at this double anniversary—the One Hundred and Tenth Anniversary of the Independence of the United States, and the Tenth Anniversary of the founding of the State as a State. The parade will move at 4 o'clock P. M. sharp, Monday, July 5th. If the invitation is accepted, please advise the undersigned.

J. BROOK,
Secretary of the Executive Committee.

Prof. C. M. WOODWARD, Assoc. Am. Soc. C. E.—I move that the invitation be accepted.

The motion was carried.

The CHAIRMAN.—Are there any suggestions or motions to be made by any person present before we proceed to the reading of a paper. If not, perhaps you gentlemen who are visiting Colorado will appreciate what an interesting subject you have brought to Colorado people as an introductory to your Convention, when I announce a paper by Captain R. L. HOXIE, M. Am. Soc. C. E., on the subject of "Excessive Rainfalls." It hardly seems intended for Colorado. However, we shall be interested in the Secretary's reading of it.

The Secretary read the paper. It was discussed by Messrs. J. J. R. Croes, David E. McComb, Robert E. McMath, Robert B. Stanton, George S. Rice, Thomas C. Keefer, John F. Barnard, Eliot C. Clarke, F. Collingwood, Jacob Blickensderfer and Charles Latimer.

The Chairman then, in behalf of the Local Committee, presented to the Members a book prepared for their use and giving very full information as to the City of Denver and the State of Colorado. The book is handsomely illustrated.

Attention was called to the exhibition in the meeting room of a number of specimens of the native building stones of Colorado. Also of Portland cement manufactured at Denver.

SECOND SESSION.

JULY 2D, EVENING.—The Members of the Society and its guests assembled at the Tabor Grand Opera House at 20:30 o'clock.

The Chairman, Mr. ROBERT B. STANTON, M. Am. Soc. C. E., in opening the meeting, said:

Ladies and Gentlemen: We are assembled here this evening to welcome to our State and City the American Society of Civil Engineers, and

as a citizen of Colorado I take great pleasure in introducing to you His Excellency Governor EATON.

Gov. EATON.—Mr. Chairman, Ladies and Gentlemen: Never before in the history of Colorado have we been honored as we are to-night. Our distinguished visitors are the forerunners of progress, the corner-stone of modern civilization. To the American engineers, their skill, their energy and their science, are more due the grand strides that civilization is making in the last half century than to any other cause. You have annihilated space and bid defiance to time. With iron bands you have connected ocean to ocean. You cause palaces to fly on wheels for our comfort and our pleasure, and to-day the world is electrified by your thought. Over thirty years ago I was holding the rod and carrying the chain for one of your distinguished members, Mr. Jacob Blickensderfer. Owing to a lull in railroad building, I took Horace Greeley's advice, and started West to grow up with the country, never expecting to see Ohio's State Engineer again. A few years passed, and I found him leading the iron horse across the great American Desert, and over our pathless mountains.

Judging of the future by the past, we have a grand and glorious prospect before us. Our hope of the future is in you. Stand by your noble calling. In behalf of the people of the State I would welcome you. I trust your visit with us may be an oasis, the shadow of a great rock in a weary land, a green spot on memory's brightest page.

Mr. HENRY FLAD, President of the Society, responded as follows.—Your Excellency: I thank you most heartily on behalf of the American Society of Civil Engineers for the kind words of welcome you have spoken to us. We came to your city to hold our Annual Convention, because we wanted to see the great works of engineering art in which your State excels—your mountain railroads and your irrigation works. But this was not the only cause for our coming. We had a common, human interest in investigating the causes of a progress which may be called unprecedented in the history of the world, when it is considered that where a few decades ago there was nothing but a desert, to-day there is a flourishing city of seventy thousand inhabitants, enjoying all the material and intellectual benefits of civilization. And last, but not least, we wanted to make the personal acquaintance of the hardy race of men who wrought these changes, and were convinced that they would extend to us the hand of brotherhood as members of a profession whose object it is, if I may be allowed to make a new definition, to overcome and remove all obstacles in the way of the material progress of the human race with the least exertion of power. In this expectation we were not deceived. Your greeting assures us that we will be welcome here, and I can assure you that we will use the opportunity offered us so

kindly to make ourselves familiar with all your works of engineering, and to become acquainted with your people. I again thank you for this kind reception.

The Chairman, Mr. R. B. STANTON.—On behalf of the City of Denver, I have the pleasure of introducing to you Mr. THOMAS NICOLL, the acting Mayor.

Mr. NICOLL.—Ladies and Gentlemen, Mr. President and Members of the American Society of Civil Engineers: It is with pleasure that I welcome you to our city, welcome you as individuals and as an association. We are glad to have representative men come among us, and honor the City of the Plains with their deliberations, and especially is this true when the association is of such importance as your organization, whose Members have, in the drainage of our cities and in the construction of other great works, left monuments to their skill that will remain long after the designer's hand is still in death and his eyes closed to worldly responsibilities and cares. The advance of a people is probably most strikingly indicated by the character of their public works. Perhaps nowhere on the continent is this fact more decidedly evident than in Colorado. What miracles have been wrought here in scarcely a score of years through the science which you represent. We have no wonders in great buildings or massive granite works. We have no St. Louis Bridge, no Erie Canal; but our mountains have been surmounted by marvels of engineering that are famous the world over. Our plains have been transformed into gardens by the handiwork of the canal builder. The precious contents of our mines have been brought to the use of civilization through the best thoughts of the mining engineer, and the healthfulness of this region has been largely enhanced by sanitary science, and a very large share of the prosperity we enjoy to-day is the result of the study, care and skill of the members of your profession. The citizens of Denver feel honored by your choice of this city as a meeting place. In your brief respite from business responsibilities, and after your adjournment, remember that you are in the midst of a hospitable people, the proud owners of a delightful and wonderful city, and that I have, in obedience to a general call, extended, and do now extend, to the Members here assembled of the American Society of Civil Engineers, the hospitality, freedom and good-will of the City of Denver.

The Chairman, Mr. R. B. STANTON.—As you are aware, this is the American Society of Civil Engineers, and embraces all America. I have the honor to introduce to you our Vice-President, Mr. THOMAS C. KEEFER, of Ottawa, Canada.

Mr. THOMAS C. KEEFER, Vice-President Am. Soc. C. E.—Ladies and Gentlemen: I have great pleasure on behalf of our Society in

recognizing the very kind reception which you have prepared for us, and the very kind sentiments expressed by your Mayor. I am sure that on this, our visit to Colorado, we are as much surprised by the City of Denver as by your mountains. The solidity of the buildings in this city, the complete municipal equipment which it possesses, show that your citizens are as much in advance of our older corporations in the East as your mountains are higher than our hills. There is a great deal to attract us Eastern people in Colorado especially. It is the nearest point where we can get elevation and civilization combined. There are many higher mountains and many places of great interest, but they are very difficult to get at, and when you get there you cannot stay there. But Colorado is, by the wonderful energy of her people, made accessible in its mountains and in its most beautiful scenery, and her people have so developed their health resorts and natural springs, that undoubtedly it will become the Switzerland of America, and when you have further advanced in this mountain development, and have more railroads from the East, you will have, I think, as much tourist travel in this State in proportion to the whole Union as Switzerland has in Europe, and that is the most profitable business that Switzerland has.

We are also pleased in coming to Colorado, because not only have we mountains covered with snow and these high elevations, but we see your prairie dogs and your jack-rabbits, which we have not in the East, and we see the wonderful effects of irrigation. That is a new thing to Eastern people. We pass over what is called the American Desert and we find a city here, a sort of Palmyra in the wilderness, which astonishes every one who sees it, and at which every person in crossing the continent—in passing from the Atlantic to the Pacific—wishes to make a stop for the reasons which I have stated, the natural beauties of this wonderful State and City.

I have been warned that new comers should not indulge in much speaking, as it is apt to produce hoarseness, and therefore I will content myself with renewing my thanks to you, Mr. Mayor, and to the citizens of Denver for this very flattering reception. This is my first appearance on this or any other stage.

The Chairman, Mr. R. B. Stanton.—To a Denver audience our next speaker needs no introduction, but to the Members of the American Society of Civil Engineers I wish to say that to his kind suggestion you will owe a great deal of your enjoyment while in this city. I have the honor to introduce to you Mr. R. W. Woodbury, the President of the Chamber of Commerce.

Mr. R. W. Woodbury.—Mr. President, Ladies and Gentlemen: The ingenuity and experience of fifty centuries have built a pinnacle of knowledge that excites the admiration and wonder of the average man

who looks toward its summit and along the rugged steps that lead thereto, and it causes him to speculate in the realm of wildest imagination at the possible height that may be attained in the far distant future. Very few men reach the summit of that pinnacle and look down; but if there be any particular profession which is there represented by a greater percentage of its members than another, I believe it to be that of the civil engineer. The very name of engineer is associated in our minds with ideas of more than average ability and patient application. Most of us who pursue the ordinary walks of life upon the level plain must be content with looking upward at this pinnacle, and many of us must even employ a good glass to catch a glimpse of the engineer who has reached and is still at labor upon the summit. But if the average business men cannot find it convenient to climb the heights, they can at least take pleasure in welcoming those who have done so when they come down to the level at the base; and so, gentlemen, it gives me pleasure to speak in the name of the business men generally, and particularly in the name of the four hundred and fifty business and professional men who constitute the Denver Chamber of Commerce and Board of Trade. Your profession and the interests of the City of Denver are closely allied. The fixing of our grades, the establishment of our sewers, the supplying of pure water, the laying of our irrigating canals, the building of our bridges, without which the City of Denver would not have reached the place of some importance that it now occupies—these are the works of the engineer. Wherever the miner delves far beneath the surface of the earth to procure the ores for our great smelting establishments, there the engineer must be. Wherever the steel arteries of commercial traffic climb into the clouds to bring those ores of gold and silver to our doors and take back the products of our markets and our farms, there the engineer has first been. Since the inception in Denver of the first narrow-gauge railroad in the world for general traffic, our Colorado engineers have overturned many former conceptions, perhaps not of the engineers as a profession, but certainly of the financiers, and have demonstrated their ability to construct practicable lines of railroad wherever there was the money to pay for them. It is entirely practicable, and some of you gentlemen will live to see the day when the tourist may leave Denver after breakfast in the morning and dine on the summit of Long's or Pike's Peak after having covered the entire distance and elevation by rail. Colorado is, and will long continue to be, the scene of some of the most novel and grand features of engineering skill upon this continent, and so it seems to us that your meeting in its metropolis, from which you may be escorted to some of the more easily reached places showing the work of our Colorado engineers, is particularly appropriate. We take much pride in the work of our local profession. We rejoice with them in the opportunity that you have given them to present their works for the

inspection of the masters of the profession, and we join with them with pleasure in endeavoring to make your visit to this city entertaining. We do this with all the more pleasure, because all but the younger portion of our people here were once emigrants from the principal States from which you hail. Your cities and your farms have all contributed to our own cosmopolitan population, and so we feel, gentlemen, that you are not strangers to us, but old friends who have known us in our former home and have kindly come out here to visit us in our new. We feel, gentlemen, that whatever benefits may result to you as a body from the deliberations of this annual gathering, will in due time be applied to the advancement of our own City and State, and we feel also that if you obtain any benefit whatever from an examination of our own works and the works of our local engineers, it will be of a greater benefit to ourselves; for we think that we are inhabiting a little the best part of this grand old Union of States, and if the entire population of the country cannot come and enjoy it with us, we would at least like to pay for our special privilege by contributing something to the scientific knowledge and advancement of those who live elsewhere.

We welcome you gentlemen, as men whose names are associated with some of the grandest works of science of the modern world. We welcome you to a city at the apex of our continent, and but a few days ride beyond the line which divides its orient from its occident. We welcome you to its beauties, to its healthfulness, to its resources, to its youthful vigor, to its past works, and to our unfaltering faith and trust in its future.

The Chairman, Mr. R. B. STANTON.—On behalf of the Society I would introduce Mr. GEORGE S. GREENE, Jr., Director of the Society, who will now address you.

Mr. GEORGE S. GREENE, Jr., Director Am. Soc. C. E.—On behalf of the American Society of Civil Engineers I beg leave to accept the kind and generous welcome which the business men of this thriving, handsome city have tendered us. We, whose part it is in life to assist and to guide business men in developing nature for the benefit of mankind, come here in order that we may better know and understand the wonderful gifts of nature which you possess, and the scarcely less wonderful uses and purposes to which you and our brethren here have adapted them. We are met on all sides with cordial, generous welcome, and I would, sir, express to you our thanks for such a welcome. But words fail me to express adequately and properly our pleasure and gratification in being here, and our high appreciation of such a welcome as we have received; but I can and do assure you, sir, that we shall long and agreeably remember our reception, here at the very base of the grand old Rockies, in this city, great already and surely destined

through your faith in yourselves and in your work, before long to rank among the greatest—Denver.

The Chairman, Mr. R. B. STANTON.—We shall now have the honor of listening to the annual address of our President, Col. Henry Flad, of St. Louis.

The President, Mr. HENRY FLAD.—Ladies and Gentlemen: It is the duty of the President of this Society to deliver annually at the Convention an address, and I have prepared such an address, but, owing to a sore throat, I have to ask a Member of the Society, my friend, Mr. Robert Moore, of St. Louis, to read that address for me, and he has kindly consented to do so.

Mr. ROBERT MOORE, M. Am. Soc. C. E.—I know it is impossible for any of you to more deeply regret the announcement that has just been made than I do, and I very much fear it will be difficult for you to keep from holding me responsible for the sore disappointment you must feel at the substitution of any other voice for that of our revered President. I can only hope that you will bear as patiently as you can with this, which is our common misfortune.

[Mr. Moore then read the President's address, which is published in the Transactions for this month.]

THIRD SESSION.

SATURDAY, JULY 3D, AFTERNOON.—The meeting was called to order at 14:50 o'clock, Mr. ROBERT B. STANTON in the chair.

The CHAIRMAN.—I have an invitation here that I will read.

To the President and Members of the American Society of Civil Engineers, Denver, Colorado.

GENTLEMEN,—At a time that will best suit your convenience, we desire to show you the operation of our Electric Railway, believing that it will greatly interest you from both engineering and scientific points of view. It involves principles claimed by no other system, and we have it in practical operation.

If we may suggest a time for your visit it will be at the close of your afternoon session to-day. The place is 15th street, crossing of Glenarm.

We are, very respectfully,
Your obedient servants,
THE U. S. ELECTRIC CO.
By WM. N. BYERS,
President.

Mr. GEO. B. NICHOLSON, M. Am. Soc. C. E.—I move that the invitation be accepted, with thanks.

The motion was carried.

Invitations to visit the Argo Smelting Works and the Grant Smelting Works were presented and accepted.

A paper by A. M. WELLINGTON, M. Am. Soc. C. E., on "The American Line from Vera Cruz to the City of Mexico, with Notes on the Best Methods for Surmounting High Elevations by Rail," was read by the author.

The chair was taken temporarily by Mr. JACOB BLICKENSDERFER, M. Am. Soc. C. E., during the reading of the above-named paper.

At the conclusion of the paper a recess was taken till evening.

FOURTH SESSION.

JULY 3D, EVENING.—Mr. ROBERT B. STANTON in the chair.

An invitation was presented from the City Engineer of Denver, Mr. H. C. Lowrie, C. E., to visit the City Hall and inspect plans and specimens of city engineering work and appliances. The invitation was accepted for the morning of July 5th, when a large number of Members met the City Engineer, and under his escort examined the sewerage and other city public works.

The paper on "The American Line from Vera Cruz to the City of Mexico, with Notes on the Best Methods for Surmounting High Elevations by Rail," by A. M. WELLINGTON, was discussed by Messrs. Robert Moore, William Watson, J. B. Johnson, H. H. Filley, Robert B. Stanton, H. P. Taussig, M. Cohen, C. M. Woodward, Francis D. H. Lawler, and A. M. Wellington.

A note by J. FOSTER FLAGG, M. Am. Soc. C. E., describing "A Remarkable Rainfall in the West Indies," was read.

FIFTH SESSION.

MONDAY, JULY 5TH, MORNING.—Mr. ROBERT B. STANTON, Chairman, presiding.

A paper by Professor ALEXIS A. JULIEN, on "Building Stones," was read.

On motion, the business meeting was then held. [For the record of the business meeting see page 85 of the current Proceedings.]

At the close of the business meeting of the Society, the session of the Convention was resumed, Mr. ROBERT B. STANTON, Chairman, presiding.

Mr. ROBERT MOORE.—Mr. President: I move that we proceed to the appointment of the Nominating Committee.

The motion was seconded.

At the request of the Chair, the Secretary read the provisions of the By-Laws referring to the appointment of a Nominating Committee.

The motion of Mr. Moore was carried.

The CHAIRMAN.—How shall this committee be appointed?

Mr. GEORGE S. MORISON.—I move that it be appointed by nomination.

The motion was carried.

After nomination, Mr. Charles Macdonald, of New York, Past Director of the Society, was elected as Chairman of the Committee.

After discussion it was determined that nominations should be continued as long as any Members desired to make nominations, and then that the additional members of the committee should be chosen by a vote by ballot. Seven nominations were made, and a vote was taken by ballot. The Nominating Committee elected is as follows:

Charles Macdonald, of New York, N. Y.; B. M. Harrod, of New Orleans, La.; Robert B. Stanton, of Denver, Colo.; Desmond FitzGerald, of Brookline, Mass.; H. Stanley Goodwin, of Bethlehem, Pa.

Sixth Session.

July 5th, Afternoon.—Mr. Robert Moore, M. Am. Soc. C. E., in the chair.

A paper on "Laying Masonry in Cold Weather," by Alfred Noble, M. Am. Soc. C. E., presented through the Committee on Compressive Strength of Cements, was read and discussed by Messrs. Collingwood, Morison, Stanton, Eliot C. Clarke and Bogart.

A paper by Edward B. Dorsey, M. Am. Soc. C. E., supplementary to the paper published in Transactions for January, 1886, on "English and American Railroads Compared," was read and discussed by Messrs. Collingwood, Stanton, Woodward, Wellington, Chanute, Morison, Vose (by letter), and Cohen.

A paper on the "Compressive Strength of Steel and Iron" by Charles A. Marshall, M. Am. Soc. C. E., was read and discussed by Mr. Collingwood.

A paper by Charles E. Emery, M. Am. Soc. C. E., on a "Novel Application of the Polar Planimeter" was read.

The paper on "The Steamship America," by Robert Gordon, M. Am. Soc. C. E., published in Transactions for May, 1886, was discussed by Messrs. Morison and Woodward.

The President, Mr. Henry Flad, offered the following resolutions; these were seconded by Vice-President Thomas C. Keefer, and were carried:

Resolved, That the American Society of Civil Engineers in Convention assembled, desires to express its appreciation of the courtesies extended to it during the visit of the Society to Colorado, and particularly to the Denver Society of Civil Engineers and its local Committee; to the Chamber of Commerce; and the Committee of Citizens of Denver.

The pamphlet prepared by the Denver Society has been a great aid in understanding the wonderful development of this beautiful City and this remarkable State.

Resolved, That the Secretary of the Society be requested to properly acknowledge the courtesies extended by the railroads in Colorado, the Union Pacific and the Denver and Rio Grande.

Resolved, That the thanks of the Convention be and are hereby extended to the Chairman of the Convention, Mr. Robert B. Stanton, M. Am. Soc. C. E., who, both as such Chairman, and as the Chairman of the Local Committee, has done so much to make this a memorable Convention in the annals of the Society.

Seventh Session.

Wednesday, July 7th, Evening.—Mr. Robert B. Stanton in the chair.

A paper on "The Davis Crevasse Levee," by S. F. Lewis, M. Am. Soc. C. E., was read.

The following 103 Members were in attendance at the Convention: E. C. Appleton, Ashland, Neb.; John W. Bacon, Danbury, Thomas S. Bishop, New Britain, Conn.; John Bogart, New York City; Wm. F. Booth, Poughkeepsie, A. Bryson, Brooklyn, N. Y.; A. Bonzano, Phœnixville, Pa.; Clifford Buxton, Toledo, Ohio; Edward Baumann, Chicago, Ill.; William R. Belknap, Louisville, Ky.; George Burnet, Jr., St. Louis, John F. Barnard, St. Joseph, Mo.; Henry I. Bliss, La Crosse, Wis.; Charles Blackwell, J. Blickensderfer, Omaha, Neb.; Eliot C. Clarke, Boston, Mass.; J. James R. Croes, New York City; William B. Cogswell, Syracuse, N. Y.; Francis Collingwood, Elizabeth, N. J.; Mendes Cohen, Baltimore, Md.; William W. Card, Pittsburgh, Pa.; O. Chanute, Kansas City, Mo.; David W. Cunningham, Grandin, Dak.; B. L. Crosby, Rulo, Neb.; Joseph P. Davis, S. B. Downes, New York City; F. de Funiak, Louisville, Ky.; Thomas Doane, Crete, Neb.; E. W. Eckert, Massillon, Ohio; George D. Emerson, Rolla, Mo.; Howard N. Elmer, St, Paul, Minn.; Robert Fletcher, Hanover, N. H.; Charles A. Ferry, New Haven, Conn.; Clark Fisher, Trenton, N. J.; Henry Flad, St. Louis, S. Waters Fox, St. Joseph, Mo.; H. H. Filley, Mexico, Mexico; Bryant Godwin, G. S. Greene, Jr., New York City; Edward B. Guthrie, Buffalo, N. Y.; Charles E. Goad, Montreal, Canada; Charles E. Greene, Ann Arbor, Mich.; Carl Gayler, St. Louis, Mo.; B. H. Greene, Helena, Mont.; Arthur H. Howland, Boston, Mass.; William G. Hamilton, William J. Haskins, William R. Hutton, New York City; James D. Hawks, F. B. Howard, Detroit, Mich.; Rudolph Hering, Chicago, Ill.; M. L. Holman, St. Louis, Mo.; H. V. Hinckley, Topeka, Kan.; John B. Johnson, St. Louis, H. F. Juengst, St. Joseph, Mo.; George A. Kimball, Somerville, Mass.; Thomas C. Keefer, Ottawa, Canada; Geo. W. Kittredge, Columbus, Ind.; Edward C. Kinney, Omaha, Neb.; Charles Latimer, Cleveland, Ohio; William H. Lotz, Chicago, Ill.; W. S. Lincoln, St. Louis, Mo.; Charles Macdonald, Thomas C. Meyer, George S. Morison, New York City; James R. Maxwell, Newark, Del.; David E. McComb, Washington, D. C.; John J. McVean, Ionia, Mich.; Henry G. Morse, Youngstown, Ohio; M. W. Mansfield, Indianapolis, Ind.; Robert E. McMath, Robert

Moore, St. Louis, Mo.; Albert F. Noyes, West Newton, Mass.; George B. Nicholson, Cincinnati, Ohio; John Nichol, Chicago, Ill.; F. S. Odell, New York City; John F. O'Rourke, Prairie du Chien, Wis.; Franklin C. Prindle, East Orange, N. J.; Joseph R. Richards, Boston, William Roberts, Waltham, Thomas F. Richardson, Wilmington, Mass.; David Reeves, Philadelphia, Pa.; L. W. Rundlett, St. Paul, Minn.; Andrew Rosewater, Omaha, Neb.; George S. Rice, Georgetown, Colo.; George F. Swain, Boston, Mass.; Robert B. Stanton, Denver, Colo.; Stevenson Towle, New York City; Alfred W. Trotter, Bristol, Tenn.; John G. Van Horne, New York City; William Watson, Boston, Mass.; James R. Wardlaw, F. W. Watkins, A. M. Wellington, William H. Wiley, New York City; Charles D. Ward, Jersey City, N. J.; J. W. Walker, Pittsburgh, Pa.; Fred. C. Weir, Cincinnati, Ohio; Thomas J. Whitman, C. M. Woodward, St. Louis, Mo.; John F. Wallace, Keithsburg, Ill.; J. A. L. Waddell, Council Bluffs, Iowa; and Samuel H. Yonge, Kansas City, Mo.

Sixty-seven ladies of the families of members accompanied them on the occasion of this Convention.

On Tuesday morning, July 6th, by invitation of the Union Pacific Railroad, Mr. J. K. Choate, Superintendent, an excursion was made to the town of Greeley, north of Denver, where the improvement of desert lands by extensive irrigation was witnessed.

On Wednesday, in accordance with the same invitation, an excursion was made through the Clear Creek Cañon to Georgetown, Colo., and to the high loop line beyond that city. After dinner at Georgetown the party returned to Denver the same evening.

On Thursday, by the same kind invitation, a trip was made over the Denver and South Park Railroad to Leadville. The three summits passed on this line are respectively 10,000, 11,498 and 11,325 feet above the level of the sea.

The evening and night of Thursday were spent at Leadville.

On Friday morning, by invitation of the Denver and Rio Grande Railway, Mr. W. S. Jackson, Receiver, Mr. R. E. Ricker, General Superintendent, the party left Leadville and proceeded to Salida, thence West through Marshall Pass, and returned through the Grand Cañon of the Arkansas and the Royal Gorge to Pueblo and Colorado Springs, and arrived at Manitou on Friday evening, spending Saturday and Sunday at that place. The ascent of Pike's Peak was made by a number of Members.

On one of the evenings during the stay at Denver, a reception at the hotel gave an opportunity for meeting many citizens.

On one of the mornings, by invitation of a number of gentlemen, the Members and visiting guests were driven about Denver and its suburbs in the private carriages of their hosts.

The party from the East left the Grand Central Depot, New York, at 10 o'clock of the morning of June 29th, in a special train of two sleeping cars of the New York Central Sleeping Car Company, and two hotel cars of Pullman's Palace Car Company. At Chicago an additional Pullman hotel car was added, and at Burlington a Pullman sleeper, with the St. Louis Members, joined the train. The route westerly was by the Hudson River to Albany, the New York Central to Buffalo, the Lake Shore and Michigan Southern to Chicago, and the Chicago, Burlington and Quincy to Denver. Chicago was reached at 10 o'clock on the morning of June 30th. Four hours and a half were spent at Chicago, and the train reached Denver at eight on the morning of Friday, July 2d.

Returning, the party left Colorado Springs on the evening of July 11th, and proceeded by the Denver and Rio Grande Railway to Denver, thence by the Kansas Pacific Division of the Union Pacific to Kansas City, thence the St. Louis car returned to that city by the Missouri Pacific. The main train proceeded by the Hannibal and St. Joseph Railroad to Quincy, by the Chicago, Burlington and Quincy to Chicago, by the Michigan Central and Canada Southern to Buffalo, and by the New York Central and Hudson River to New York, arriving Wednesday evening, July 14th.

Throughout the whole trip, and also during the excursions in Colorado, every suitable courtesy and attention was given to the Society by the officers of and all connected with the railway lines. While at Denver, the Local Committee, the Members of the Denver Society of Civil Engineers, the Committee of the Chamber of Commerce, and the citizens of Denver were constant in efforts to aid the Society in the purposes of the Convention.

MEETINGS OF THE SOCIETY.

JUNE 16TH, 1886.—The Society met at 20 o'clock, Past Vice-President William H. Paine, in the chair; John Bogart, Secretary.

A paper by F. S. ODELL, M. Am. Soc. C. E., on "The Water Supply and Sewerage of the Lawrenceville (N. J.), School," was read by the author and discussed.

JULY 5TH, 1886.—(Business meeting during the Annual Convention at Denver, Colo.) The President, Henry Flad, in the chair; John Bogart, Secretary.

The PRESIDENT.—Are there any communications received since the last regular meeting?

The Secretary read the following letter:

June 26th, 1886.

HENRY FLAD, Esq.,

President of the American Society of Civil Engineers.

SIR,—Referring to the communication addressed to you by Mr. John R. Whitley in January last, I desire, as President of the American Exhibition to be held next year in London, to confirm the cordial invitation extended to you and the Members of the Society of Civil Engineers by Mr. Whitley, on behalf of the Board of Direction of our Exhibition in London, and I shall be pleased to learn that the same will be accepted by yourself and a large number of your colleagues.

Yours very respectfully,

E. B. WASHBURNE,
Of Illinois.

The PRESIDENT.—What is your pleasure with reference to this communication?

Mr. J. J. R. CROES.—I move that it be laid on the table, and that the Secretary be instructed to express to the chairman of that exhibition the thanks of the Society for their kind invitation.

The motion was seconded by Mr. R. B. Stanton and carried.

The PRESIDENT.—Are there any communications to be read from Members present? If not, the next thing in order will be communications from the Board of Direction.

The SECRETARY.—I have none, sir.

The PRESIDENT.—Are there any committees ready to report?

The SECRETARY.—I have, Mr. President, one or two written reports, and then there are other committees whose chairmen are present. The first is the report of the Committee upon Uniform Standard Time, which I have here.

The PRESIDENT.—Read it, please.

The Secretary read the report of the Committee as follows:

REPORT OF THE SPECIAL COMMITTEE ON STANDARD TIME.

July 5th, 1886.

The Committee on Standard Time desire to report progress.

In the report presented at the Annual Meeting of the Society in January last, among other things it was stated that the Canadian Pacific Railway Company had publicly announced its intention to adopt the twenty-four hour system at an early day. Since then the watches of employees of the Company, and all stationary clocks, have been adapted to the new notation, and the public along the line of railway have gratuitously been furnished with new dials by the Company. On or about the 1st of July, the Canadian Pacific Railway will be opened from ocean to ocean for public traffic, and trains will then be run on the twenty-four hour system. The time tables for operating the line on the changed plan are prepared. For some months back the Canadian Pacific telegraph has been worked on the twenty-four hour system. On the

other side of the globe the entire net-work of telegraphs of the Eastern Telegraph Company has been operated with advantage on the twenty-four hour plan. This Company's lines extend from England to Egypt, South Africa, India, China, Japan, Australia and New Zealand.

The Smithsonian Institution desiring to co-operate in the important movement of Time Reform, is about to publish, for diffusion in all quarters of the globe, A Memoir on Time Reckoning for the Twentieth Century. The Committee has been furnished with a copy of this paper, which, with the permission of the Smithsonian Institution, may be read to the Convention.

SANDFORD FLEMING, *Chairman.*

Mr. CROES.—I move that the report be accepted and the Committee continued.

The motion was carried.

The PRESIDENT.—Is there any report from the Committee to consider Changes in Organization of the Society?

Mr. A. M. WELLINGTON.—I believe that there is no report of that Committee ready.

Mr. ROBERT MOORE.—I would like to ask if there is any probability of a report, if not, I would like to follow it by a motion that the Committee be discharged.

The motion was seconded and carried.

The PRESIDENT.—Is the Committee to consider a Plan for Creating a Library for Joint Use, ready to report?

Mr. GEORGE S. MORISON.—I believe I am a member of that Committee, but I have not met with it for several months. The Committee has held two or three meetings. It is not, I believe, prepared to make a report of any kind. That is all that I can say. The Committee is a very complicated one. There is a Committee appointed by this Society; there are Committees appointed by several other Societies; these Committees met together and appointed for some special purposes a Joint Committee, composed of one member of the Committee of each Society. So far there have been two or three meetings, at which very little has been done. It is a matter, that if done at all, will take a great deal of time. As matters now stand, there is absolutely nothing to say in the way of a report.

A motion was offered that the Committee be discharged.

Mr. CROES.—Does the gentleman ask that the Committee be continued, or has he any suggestion to make?

Mr. MORISON.—I should prefer to make no request of any kind. It should be remembered that there are these other Committees appointed by other Societies, which Committees, so far as any action has been taken, have been acting together, and it might be unpolite to the other Societies to discharge this Committee.

Mr. JOHN BOGART.—I would suggest that the Committee be continued. I don't think any harm will be done.

Mr. CROES.—I move that the Committee be continued, and the verbal report of the member present accepted.

The motion was carried.

The PRESIDENT.—There is a Committee to consider the Proper Relation to Each Other of the Sections of Railway Wheels and Rails. Is that Committee ready to report?

Mr. A. M. WELLINGTON.—On behalf of the Chairman of that Committee, Mr. H. Stanley Goodwin, who is not present, I have to report progress, and state that the subject is under consideration by the individual members of the Committee. It has been arranged, owing to the widely separated residences of the Committee, that the simplest way will be that each one of the members of the Committee shall prepare a paper for submission to the Society, individually, which can then be discussed by the members of the Committee, and after that a report of the Committee be prepared. Therefore the Committee ask to be continued.

Mr. ROBERT E. MCMATH.—I move that the Committee be continued.

The motion was carried.

The PRESIDENT.—There is a Committee which is to report on the Compressive Strength of Cements, and the Compression of Cements and the Settlement of Masonry.

The SECRETARY.—The Chairman of the Committee, Mr. Collingwood, will be here directly. I suggest that that be passed over temporarily.

The PRESIDENT.—We can pass it over temporarily, and take it up when Mr. Collingwood returns.

Mr. ROBERT MOORE.—I would like to say that in making the motion to discharge the Committee on the Relations of the Various Engineering Societies, it was not to dismiss the subject from the consideration of the Society or the Convention, but because, as I understood, somewhat indirectly, the Committee had no chairman, and was in a condition from which we could not expect any report. I think the question is a very important one, and should be thoroughly discussed. I think a discussion by this Convention, which would elicit all the views on the subject is a very important matter for this Convention to take up.

The PRESIDENT.—That matter can be taken up when we come to new business. Unfinished business is next.

The SECRETARY.—No unfinished business is presented.

The PRESIDENT.—Then comes new business.

Mr. ROBERT MOORE.—I have no suggestions myself to offer. I should like very much to hear from the members of the Committee who have given the matter consideration, and to know their individual views, which, I have no doubt, they have formed quite definitely. I have impressions upon the subject, but they are not crystallized into positive convictions, and I would like to have more light on it, and desire very much to hear from the members of the Committee.

Mr. A. M. WELLINGTON.—So far as I am individually concerned, as one of the members of the old Committee, I think I have given my views in a paper distributed to the Members of the Society. I may say, I think for all the members of the Committee, that a large part of the difficulty which came in was in regard to questions of detail, and the difficulty in coming to any definite understanding on questions of detail was, in a large part, on account of their scattered residences. When they did have meetings, which was only on two occasions, the members were generally so busy that they could not devote any great amount of time to a consideration of the question. For myself, individually, I still retain exactly the views that I expressed before, and I shall be very sorry indeed if something is not done to enlarge the scope of the Society in the general direction which has been suggested and which was contemplated by the resolution appointing the Committee. Nevertheless, so far as I am individually concerned, it is nothing to me. The Society suits me very well as it is. I am perfectly willing that the Society should try the experiment of letting matters go on as they are.

Mr. CHARLES MACDONALD.—As one of the members of that Committee, I may say that every member of it had the same feeling in regard to the importance of some action being taken by this Society whereby a unity of interest and feeling might be engendered with all the societies outlying from New York. We had two meetings in New York, and the majority of us came to a conclusion in regard to what was best to be done. By reason of certain lapses and misunderstandings, which it is not necessary here to detail, those conclusions were not acted upon. I think myself that, perhaps, if another Committee were appointed, and the whole subject taken up again, it would be well. The view that I had personally, was that it would be injudicious to attempt any organic change in the American Society of Civil Engineers whereby a connection between the different societies or clubs existing in differents parts of the Union with the parent society might be brought about. I say that I thought it was injudicious to attempt any such legislation. In the first place it would take a long time to make a change in our Constitution which would bring that about. Then it was not altogether certain that if we decided upon any particular form of legislation it would be acceptable to the members of the different clubs. It was a very delicate thing I found to take action of that kind, but it seemed to me that a practical union or community of action and interest might be brought about by adopting some method for the publication of Transactions and disseminating them broadcast, not only among the Members of the Society itself, but the members of all the clubs. That would not require any organic change in our own body. It would not be asking the members of the clubs to become members of the Society in any sense. That might not be agreeable to them. It would not make it necessary for us to change our standard of admission, nor our methods of electing mem-

bers. But it would be doing all that we are organized for, and that is, the dissemination of professional information. It would be opening the doors of the Society for the receipt of all papers that were presented by members of local clubs, the publication by the Society of such papers, and their discussion and practical incorporation into the Transactions of the American Society of Civil Engineers. That would have the indirect effect of making all the members of the local clubs and societies perfectly aware of what was being done, and of the benefits arising from being members of the American Society of Civil Engineers. Without offering them any special official inducements, it would, I believe, have the effect of so impressing them with the importance of belonging to the parent society that it would increase our membership very largely. At the same time it would have the immediate effect of securing for the Society the very best technical papers that were presented, not only by our own Members, but throughout all the different clubs in the country. That was my view and that of some other members of the Committee, and I feel very certain that some action ought to be taken by the Society towards bringing about some such end as that, and that a new Committee ought to be appointed. If a judicious selection is made, I believe that a report may be expected from such a Committee which might be acted upon at the next regular meeting.

Mr. MORISON.—Might it not be worth while to carry out a portion of Mr. Macdonald's suggestion without carrying out the whole? Why would it not be well to encourage the expression of individual opinion, as far as is possible, between now and the next annual meeting, with the understanding that a committee is to be appointed at that meeting to consider this subject? The Board of Direction could very well invite the different Members of the Society to contribute their opinions in writing on this subject, with the express understanding that such of those opinions as were thought best should be published in the Transactions of the Society; or, better, in some special form. In that way the subject could be pretty well canvassed without the immediate appointment of a committee. Time would be given to consider what could be best done at the next general meeting of the Society. I would therefore move that this subject be referred to the Board of Direction, with the request that they invite written communications from the Members of the Society, and that the Board of Direction shall report on this subject at the next annual meeting, with the expectation that a special committee be appointed at that time.

The motion was seconded.

Mr. MORISON.—Before the matter goes any further, I should like to add to the motion a provision that the Board of Direction may invite communications from the different engineering clubs throughout the country.

Mr. WELLINGTON.—In seconding Mr. Morison's motion, which seems

to me one of the wisest moves in a general way that can be taken for reaching some definite conclusion, I would suggest an addendum to it, and that is whether it would not be expedient that one or more (two or three possibly) special meetings of the Society should be held after these reports have been submitted, for their discussion. If our Committee could have met conveniently and it could be certain that all the members of the Committee felt a real interest in the matter, which perhaps one or two did not, although I think they did, it might not have been impossible for us to have reached a conclusion. But it is a frequent difficulty of committees that their members are scattered, and very often one or two or three or four take little interest and all the real work falls on one or two. By calling special meetings of the Society, those interested would attend, those who were not would stay away, and I think it would result in enabling a conclusion to be arrived at which would be more definite.

The PRESIDENT.—Are you ready to vote on Mr. Morison's proposition? If I understand right, the motion is that the Board of Direction should be instructed to request the Members to state their views in writing in regard to the subject matter, and also members of the other societies interested.

Mr. MORISON.—That the views so expressed be printed and distributed among the Members of the Society, and the matter reported on at the next annual meeting.

Mr. CROES.—I would like to know whether Mr. Morison intends that all the individual communications should be published and spread before the Society, or that they should be edited?

Mr. MORISON.—In such a case as this there is always some probability of communications being sent in which neither the writer nor any one else expects to be printed. I think the understanding should be that the Direction should give to the Society what is virtually the whole, but should exercise the privilege, which they always ought to, of editing.

Mr. MACDONALD.—The Direction, as I understand, are to take this matter in hand now and get up the information which is in question and then let it be laid before the annual meeting.

Mr. MORISON.—I think it is desirable that it should be in the hands of members a sufficient time to read it before the annual meeting. I do not think it would be practicable with the annual meeting only six months off to have any action before the annual meeting, but I think a subject of this kind ought to be in print and in the hands of the Members.

Mr. MCMATH.—If the Board of Direction have no authority to submit to the Society for consideration their recommendations in the matter, I would move that they be instructed to do that.

The PRESIDENT.—Mr. McMath proposes that the Board of Direction should be instructed to state their own views in regard to the matter.

Mr. MORISON.—It seems to me that the Board of Direction would have the power to do that at any rate, and that we should expect them to do it. I think we might fairly leave that to the judgment of the Direction.

Mr. MCMATH.—I just threw that out as a suggestion. It is desirable at least, after the Board of Direction has all this matter in hand—they are supposed to read it, which all the Members will not do—it is desirable that they should crystallize the whole matter into the shape of some definite recommendation, and then let the Society adopt or reject the specific measure or an alternative measure proposed by them.

Mr. MORISON.—I am willing to accept the amendment if it be put in this form: "With such conclusions as they desire to lay before the Society."

Mr. MCMATH.—That meets my views exactly.

The SECRETARY.—I suggest, Mr. President, if it be agreeable, that Mr. Morison be requested to dictate a concise resolution covering these points.

Mr. Morison then dictated to the stenographer the following resolution:

"That this subject be referred to the Board of Direction, with the request that they invite written communications from the Members of the Society, and from the different engineering clubs throughout the country, and that these communications be edited under the direction of the Board, and their substance printed and distributed among the Members of the Society. And that the Board shall make a report at the next annual meeting, with such conclusions as they desire to lay before the Society, and with the expectation that a special committee will be appointed at that time."

The resolution was adopted.

The SECRETARY.—The Chairman of the Committee on the Compression of Cements is here now, sir.

The PRESIDENT.—If Mr. Collingwood is ready to report we shall be glad to hear from him.

Mr. F. Collingwood, Chairman, presented the report.*

Mr. COLLINGWOOD.—I have another paper furnished by Mr. Alfred Noble, M. Am. Soc. C. E., showing results in setting masonry in very cold weather, which the Secretary thinks should be presented.

The SECRETARY.—That is a technical paper, and we are now dealing with the reports of Committees. I suggest that Mr. Noble's paper be read in one of the Convention Sessions.

Mr. MCMATH.—I move that the report be accepted, and that the Committee be continued.

The motion was carried.

Mr. C. M. WOODWARD.—Under the head of new business, I desire to

*This report will be published in a future number of Proceedings.

submit to this Society the following resolution. It will be seen that it is in the interest of economy and perfected work.

"*Resolved*, That this Convention submits to the Committee in charge of arrangements for the next Annual Convention of the Society, the following suggestions:

"*First.*—To print beforehand all papers to be presented at the Convention, including such papers already presented, but not yet printed in the Transactions, as the Committee may select, and to furnish each Member with advance sheets of the same at least three weeks before the meeting.

"*Second.*—To arrange a programme for the Sessions of the Convention, allowing authors of papers ten minutes each in which to present the abstracts, or to call attention to salient points in their papers.

"*Third.*—To invite Members to prepare discussions, and to assign a definite amount of time to the discussion of each paper, proportioned to the probable interest and demand.

"*Fourth.*—To instruct the presiding officer at the meetings to strictly observe the following rules:

"(*a*) To allow the author of a paper to close the discussion upon the same, either at the meeting or in print, as may be most convenient.

"(*b*) To allow no one more than five minutes, nor the floor a second time, in the discussion of a paper, except by unanimous consent.

"(*c*) To give the preference in a discussion to those who have signified their desire to participate.

"(*d*) And to rigidly carry out the pre-arranged programme, taking up each paper at the hour assigned, and leaving additional or miscellaneous discussions for an hour reserved for that purpose."

Mr. BOGART.—I desire to second the resolution. One of the great troubles in managing the business of the Convention, to the Secretary and to the Committee in charge of it, is the work that is covered by this resolution. We have tried something like this before, but there are several provisions in this resolution which cover points that made our previous trials not thoroughly effective. In particular I refer to one, which is that papers which have been presented to the Society before a Convention, but which have not yet come to be printed in the Transactions on account of other papers being in advance of them, may be considered as Convention papers. Our trouble has been in regard to this matter, that the gentlemen who promise papers for Conventions, and promise them indubitably with good faith, and with the intention to get them in the proper length of time before the Convention, generally do not do it. The result is that the papers come in at the very last moment, and that there is not time to get them printed and circulated properly for discussion. Therefore I take pleasure in seconding the resolution.

Mr. CROES.—This is a business meeting of the Society. This is not the Convention. Now, if the resolution is to be offered as a resolution of the Convention, it wants to be offered after the business meeting has adjourned. If it is a resolution passed by the Society at this time it wants to be so expressed.

The SECRETARY.—Will Mr. Croes suggest the desired modification?

Mr. CROES.—The resolution begins: "*Resolved*, That this Convention submits."

Mr. WOODWARD.—I think the criticism is a good one. It seems to me the point is well taken, and if the Society will allow me, I will change the word "Convention" to "Meeting."

Mr. COLLINGWOOD.—It occurs to me that there might be an amendment to these suggestions. In the practice of the Institution of Engineers they are in the habit always of requiring an abstract for reading at a meeting. Very many of the papers that are presented here, if properly abstracted, the salient points being given, omitting figures except as illustrations, would be heard with interest, whereas we get tired out before they are finished. A properly arranged abstract, which could be quickly printed and circulated, would not necessitate the printing of the original paper before the meeting, and then with properly arranged illustrations, it would add greatly to the interest. I would like to make that as an amendment to these suggestions.

Mr. WOODWARD.—I will accept that amendment if my seconder will allow, and suggest that it be added properly to the wording of the resolution.

The resolution was then amended so that the first line should read: "*Resolved*, That this meeting submits," etc., etc.

Also that the first section of the resolution should read:

"*First.*—To print beforehand abstracts of all papers to be presented at the Convention, including abstracts of such papers already presented, but not yet printed in the Transactions, as the Committee may select, and to furnish each Member with advance sheets of such abstracts at least three weeks before the meeting."

The resolution thus amended was adopted.

Mr. ROBERT MOORE.—As one part of the business of this Convention is the appointment of a Nominating Committee, I have a resolution to offer on that subject. As you are all aware, probably, the By-Laws require that at the Annual Convention a Nominating Committee of five shall be appointed, and as, prefatory to explaining the purpose of this resolution, it may be well to call attention to the fact that this Society is a corporation under the laws of the State of New York, and that, according to the Constitution of the Society, a majority of the Board of Direction must be residents of the State of New York, where the Society has its legal domicile. Of course the Resident Directors, who are charged by law and custom with the conduct of the business of the Society,

should be chosen with great care; not only those who are familiar with the business of the Society, but those whose engagements would permit them to give proper attention to that business, so that it is extremely important that those who are charged with the business of the Society shall be chosen with the utmost care, and it is for that purpose that at the suggestion of a number of the older Members of the Society, and notably at the suggestion of our Past President, Mr. Don. J. Whittemore, this resolution is brought forward:

"*Resolved*, That the Chairman of the Nominating Committee shall be a Resident Member, who is a past Officer or Director of the Society."

The last qualification is put in from the fact that the service of any one as an officer or director of the Society will no doubt have acquainted him with the necessities of the position in such a manner that he will be more likely to suggest a good nomination than one who has not had that experience. I think it will conduce very greatly to wise action in this matter, and perhaps avoid some errors that have been made through ignorance, growing out of the fact that the members of the Nominating Committee were persons who did not know the requirements of the case, who did not know the persons from whom the Resident Directors should be chosen, rather than from any other reason. I therefore make this motion.

The motion was seconded and carried.

Mr. M. COHEN.—I move that this meeting of the Society do now adjourn.

The motion was carried.

LIST OF MEMBERS.

ADDITIONS.

MEMBERS.		Date of Election
ATWATER, ALMON BYRON	Superintendent Chicago and Grand Trunk and Detroit, Grand Haven and Milwaukee R'ys, Detroit, Mich	May 5, 1886.
BRACKENRIDGE, WILLIAM ALGERNON	Principal Assistant Engineer Brooklyn and Long Island Cable R'y, Brooklyn, N. Y.	June 2, 1886.
EATON, FREDERICK	Consulting Engineer Los Angeles City Water Co., Los Angeles, Cal.	May 5, 1886.
FULLER, EUGENE FREDERICK	18 Wall street, New York City	May 5, 1886.
GILLHAM, ROBERT	Chief Engineer Inter-State Rapid Transit R'y, Shiedley Building, Kansas City, Mo	June 2, 1886.
HOWLAND, ARTHUR HENSHAW	United States Hotel, Boston, Mass.	June 2, 1886.
HOXIE, RICHARD LEVERIDGE	Captain Corps of Engineers, U. S. A., Montgomery, Ala	June 2, 1886.
HUSON, HERBERT SHERMAN	Assistant Engineer Yakima Div. Northern Pacific R. R., Ellensburg, Wash	June 2, 1886.
JACKSON, CHARLES EDWARD	Principal Assistant Engineer Brooklyn Elevated R'y, 122 East Nineteenth Street, New York City	June 2, 1886.
LAWTON, WILLIAM HENRY, JR.	20 Bellevue avenue, Newport, R.I.	June 2, 1886.
MCKEE, SAMUEL BINGHAM	Canadian Pacific R'y Offices, Montreal, Canada	June 2, 1886.
SAWYER, CHARLES HENRY	Assistant Engineer Union Pacific R'y, Pilot, Nebraska	June 2, 1886.
SCHAEFFER, JOHN STEWART	Engineer and Superintendent Newark's Improved Sewerage, Heath Building, Newark, N. J.	June 2, 1886.
SCOTT, ADDISON MOFFAT	U. S. Assistant Engineer, Charleston, West Va	June 2, 1886.
WALLACE, JOHN FINDLEY	Master of Transportation and Engineer of Construction Eastern and Illinois Divisions Central Iowa R'y, Keithsburg, Ill	June 2, 1886.

ASSOCIATE. Date of Election.

WOODWARD, CALVIN MILTON...Thayer Professor of Applied Mechanics and Higher Mathematics, Dean of Polytechnic School, Washington University, St. Louis, Mo.....June 2, 1886.

JUNIORS.

BARNEY, SAMUEL EBEN, JR....P. O. Box 602, New Haven, Conn. June 2, 1886.
BONNETT, CHARLES PIERRE....421 Westminster avenue, Elizabeth, N. J.....June 2, 1886.
GOLDSMITH, NATHANIEL OLIVER. Engineer The Weir Frog Co., Glendale, Ohio.....June 2, 1886.
MILLS, CHARLES MALON.....(Care Union Bridge Co.), 18 Broadway, New York City.....June 2, 1886.
SEAMAN, HENRY BOWMAN.....Assistant Engineer Kings County Elevated R'y, 26 Court Street, Brooklyn, N. Y.....June 2, 1886.
VAN ZILE, HARRY LEE.....Troy and Albany Bridge and Ironworks, Troy, N. Y.....Jan. 6, 1886.

CHANGES AND CORRECTIONS.

MEMBERS.

ABERT, S. THAYER.....U. S. Agent, 810 Nineteenth street, N. W., Washington, D. C.
ALLEN, JAMES P.....9 Bull street, Charleston, S. C.
ATWOOD, WILLIAM H.....Division Engineer Colorado Midland R'y, Colorado Springs, Colo.
APPLETON, THOMAS.....(Care Chief Engineer Chicago, St. Paul and Milwaukee R'y), Milwaukee, Wis.
BABCOCK, HENRY N.....Room 57, Army Building, New York City.
BAKER, WILLIAM H..... ...Lock Box 6, Keokuk, Iowa.
BARNARD, AUGUSTUS P.....Sheffield, Berkshire Co., Mass.
BECKWITH, LEONARD F.....261 Broadway, Rooms 24 and 25, New York City.
BELL, ANDREW.....Almonte, Ont., Canada.
BOGUE, VIRGIL G.....Principal Assistant Engineer Northern Pacific R. R., Tacoma, Wash.
BROOKS, FRED.....31 Milk street, Boston, Mass.
CHESBROUGH, E. S.....17 Bellevue place, Chicago, Ill.
CROWELL, J. FOSTER.....Engineer of Construction Cincinnati and Richmond R. R., Little Miami Depot, Cincinnati, Ohio.
DAVIS, CHESTER B.....Rooms 75 and 76, Calumet Building, Chicago, Ill.
DEMPSTER, ALEXANDER.....43 Sixth avenue, Pittsburg, Pa.
DOANE, WALTER A.....Division Engineer Atchison, Topeka and Santa Fé R. R., Cedarvale, Kansas.

FULLER, SIDNEY T.....P. O. Box 37, Kennebunk, Me.
GELLETTE, WILLIAM D.....(Care Chief Engineer Southern Pacific Co.), corner Fourth and Townsend streets, San Francisco, Cal.
GILLESPIE, JOSHUA L.....Box 2396, St. Paul, Minn.
HARRIS, WILLIAM P.....General Superintendent St. Joseph and St. Louis R. R., St. Joseph, Mo.
HARROD, BENJAMIN M.....Cotton Exchange Building, New Orleans, La.
HAVEN, WILLIAM A.....P. O. box 770, Helena, Montana.
HAYES, R. S.....(Care John S. Barnes), 18 Wall street, New York City.
HENTHORN, JOHN T.....173 Westminster street, Providence, R. I.
HERING, RUDOLPH.....Chief Engineer Drainage and Water Supply Commission, City Hall, Chicago, Ill.
HOWE, MILTON G.....Receiver Houston, East and West Texas R. R., Houston, Texas.
KATTÉ, WALTER.....Chief Engineer New York Central and Hudson River R. R., Grand Central Depot, New York City.
KILLEBREW, SAMUEL.....Assistant Engineer Mexican International R.R., Eagle Pass, Texas.
KINNEY, EDWARD C.....Assistant to Chief Engineer Union Pacific R'y, Omaha, Neb.
KITTREDGE, GEORGE W.....Engineer Maintenance of Way Jeffersonville, Madison and Indianapolis R. R., Columbus, Ind.
LAFON, THOMAS.....Engineer's Office Burlington and Missouri River R.R, Lincoln, Neb.
LATHAM, HARRY H.....Chief Engineer Utah and Wyoming R.R., Montauk Block, Chicago, Ill.
LUDLOW, WILLIAM.....Bvt. Lt.-Col. U. S. A., Engineer Commissioner District Columbia, Washington, D. C.
LUCIUS, ALBERT.....Chief Engineer Brooklyn, Bath and West End R.R., 297 Tenth st., South Brooklyn, N. Y.
MACLAY, WILLIAM W.....Superintendent Department of Docks office, foot Duane st., North River, New York City.
MAN, ALBON P., JR.....Ocala, Florida.
MAXWELL, JAMES R.....Division Engineer Union Pacific R'y, Butte, Montana.
MCALPINE, WILLIAM J.....Cor. Franklin and Pendleton aves, New Brighton, Richmond Co., N. Y.
MCCLINTOCK, WILLIAM H.....Resident Engineer Atlanta and West Point R.R., Western R'y of Alabama, and Cincinnati, Selma and Mobile R'y, Montgomery, Ala.
MCKEOWN, THOMAS.....37 City road, London, E. C., England.
MORRIS, ROBERT C.....Chief Engineer Nashville, Chatanooga and St. Louis R. R., Nashville, Tenn.
NICHOLS, AURIN B.....Rathmell, Pa.

PARET, MILNOR P.....Division Engineer Cincinnati and Richmond R.R., Oakley, Ohio.

PETERSON, PETER A.....Engineer Eastern Ontario and Quebec Division Canadian Pacific R'y, Chief Engineer St. Lawrence Bridge, Montreal, Canada.

RICHARDS, CHARLES B.....Professor Mechanical Engineering Sheffield Scientific School, Yale College, New Haven, Conn.

ROWE, SAMUEL M.....Resident Engineer Atchison, Topeka and Santa Fé R'y, Topeka, Kansas.

SCOTT, ARTHUR H.....First Assistant City Engineer, Milwaukee, Wis.

SORZANO, JULIO F.....33 Broadway, New York City.

THACKRAY, GEORGE E.....Youngstown Steel Co., Youngstown, Ohio.

THOMAS, JOSEPH R.....138 East 79th st., New York City.

TOWLE, STEVENSON.....115 Broadway, New York City.

VAN SANT, ROBERT L.....Chief Engineer St. Louis, Arkansas and Texas R'y, Texarkana, Texas.

WADDELL, JOHN A. L.....Phœnix Bridge Co., Phœnixville, Pa.

ASSOCIATES.

CARD, JOSEPH P.....President Chicago Tie Preserving Co., Chicago, Ill.

HENDRIE, JOHN S.....Railway Contractor, Hamilton, Ontario, Canada.

PUTNAM, JOSEPH W.....Drawer 253, New Orleans, La.

JUNIORS.

BARLOW, JOHN Q.....Assistant Engineer Northern Pacific R. R., Ellensburg, Wash.

FRANCIS, GEORGE B.....Assistant Engineer New York Central and Hudson River R. R., Depot Building, Rochester, N. Y.

FREEMAN, JOHN R.....31 Milk st., Boston, Mass.

KELLOGG, NORMAN B.....Division Roadmaster Southern Pacific Co., West Oakland, Cal.

MARVIN, CHARLES E.....Assistant Engineer Louisville and Nashville Division L. and N. R. R., Evansville, Ind.

ROSENWEIG, ALFRED.....Calle Cadena 3, Mexico, Mexico, *via* El Paso, Texas.

SANFORD, DAVID C.....Field Engineer Conn. Shell Fishery Commission, Box 1512, New Haven, Conn.

SMITH, MAXWELL.....Assistant Engineer Chicago, Milwaukee and St. Paul R'y, Milwaukee, Wis.

FELLOWS.

GILMAN, CHARLES C.....President The International Terra-Cotta Lumber Co., 115 Dearborn st., Chicago, Ill.

GURNEE, WALTER S.....7 Nassau st., New York City.

CONTRIBUTIONS TO THE BUILDING FUND.

By a resolution of the Board of Direction, all contributions to the Building Fund are to be acknowledged, from time to time by printing lists of the same in the monthly Proceedings of the Society, and in addition to this the names of all those who may subscribe $100 or more are to be regularly enrolled and published in future lists of the Society under the head of Subscribers to the Building Fund, and they will be entitled to receive one copy of the monthly publications, comprising all papers and transactions of the Society, regularly for life, for each $100 subscribed by them; such copies to be in addition to those which they may be already entitled to if they are Members or Fellows.

The following contribution up to this time is acknowledged:

William H. Paine..... $100 00

American Society of Civil Engineers.

PROCEEDINGS.

Vol. XII.—August, 1886.

[No meetings of the Society have been held during July and August except the meeting during the Convention, the report of which has been published in Proceedings for July.]

ADDITIONS TO

LIBRARY AND MUSEUM.

From American Institute of Mining Engineers, Dr. R. W. Raymond, Secretary, New York City:

The Estimation of Manganese in Iron and Steel by the Color Method. Alfred E. Hunt.
Mexican Weights and Measures. E. Richard Chism.
A Sectional Slag and Matte-Pot. Richard H. Terhune.
Specific Gravity of Low-Callow Steel. F. Lynwood Garrison.
The Action of Dilute Acids on Certain Varieties of Fused Sulphide of Iron. Edward Hart.
Notes on some Chinese Coals. John C. F. Randolph.
Sectional Hanging-Pipe Hot-Blast Oven. Arthur F. Wendt.
The Economic Geology of the Bristol and Bigstone Gap Section of Tennessee and Virginia. C. R. Boyd.
The Copper Ores of the South-West. Arthur F. Wendt.
A Rapid Method for the Determination of Phosphorus. F. A. Emmerton.
Note on the New Chemical Laboratory of the Missouri School of Mines. Prof. Charles E. Wait.
The Iron Ores and Coals of Alabama, Georgia and Tennessee. John B. Porter.
Notes of Mining in Oaxaca. W. A. Hooker.
Notes on the Geology of the Tilly Foster Ore Body, Putnam County, N. Y.
Proceedings of the Forty-fifth Meeting, Bethlehem, Pa., May, 1886.
Calorimetric Estimation of Manganese in Steel. Byron W. Cheever.
List of Officers, Members, Rules, etc., June, 1886.
The Antiolinal Theory of National Gas. H. M. Chance.
The Clapp-Griffiths Converter—Later Practice and Commercial Results. J. P. Witherow.
The Microscopic Structure of Car-Wheel Iron. F. Lynwood Garrison.
Discussion of Kent on Failures of Steel Boiler-Plates. Prof. T. Egleston.
The Effect of Caustic Lime in the Lixiviation of Silver Ores. C. A. Stetefeldt.
Soft Steel for Boiler-Plates. Alfred E. Hunt.
The Product of the Hibernia Iron Mine, N. J. J. Wesley Pullman.
The Cornwall Iron-Ore Mines, Lebanon Co., Pa. E. V. d'Invilliers.
Operation of Warwick Furnace, Pennsylvania, from August 27th, 1880, to September 1st, 1885. John Birkenbine.
Discussion of Blake on Utah Iron-Ore Deposits. G. W. Maynard.
Notes on the Stamp Mills and Chlorination Works of the Plymouth Consolidated Gold Mining Company, Amador County, Cal. George W. Small.

From American Iron and Steel Association, James M. Swank, Secretary, Philadelphia, Pa.:

Annual Statistical Report for 1885.

From Lewis S. Alter, Cor. Secy. Asso-

ciation of County Surveyors and Civil Engineers of Indiana, Remington:

Proceedings of the Association for January 19th and 20th, 1886.

From James Angline & Co., Washington, D. C.:

Catalogue of the More Valuable Publications of the U, S. Government, 1885.

From Rear-Admiral Daniel Ammen, U. S. N., Washington, D. C.:

The Errors and Fallacies of the Inter-Oceanic Transit Question.

From George H. Benzenberg, Milwaukee, Wis.:

Annual Report of the Board of Public Works and City Engineer of the City of Milwaukee for the year ending December 31st, 1885.

From Board of Railroad Commissioners of the State of New York:

Third Annual Report, Vols. I and II, for 1885.

From Henry R. Bradbury, New York City:

Report of Works Executed by the Commissioners of Sewers of the City of London, during the year 1884-85. By Wm. Haywood.

From W. H. Breithaupt, Kansas City, Mo.:

Photograph of Hannibal and St. Joseph Bridge, Kansas City, Mo., May 12th, 1886.

From Fred. Brooks, Boston, Mass.:

Report of Committee of Boston Society of Civil Engineers on Weights and Measures. (Several Copies.)

From Bureau of Navigation, Washington, D. C.:

Pilot Chart for the North Atlantic Ocean for the Months of May, June, July and August, 1886.

The Naval Brigade and Operations Ashore.

From M. J. Butler, Napanee, Canada:

Proceedings of the Associations of Provincial Land Surveyors of Ontario, February 23d, 24th and 25th, 1886.

From B. A. Colonna, Washington, D. C.:

Testimony before the Joint Commission to Consider the Present Organization of the Surveys.

From J. James R. Croes, New York City:

Framed Photograph of the Harlem River Bridge of the Suburban Rapid Transit Co.

Contract for the Construction of the Iron Structures, Piers and Foundations of the Third Avenue Line of the Suburban Rapid Transit Co.

Specifications for Cast-Iron Bases and Wheel-Guards for the same.

From A. S. Crowninshield, Naval Advisory Board, Washington, D. C.:

Description of Route, Estimated Cost and Business of the Nicaragua Canal. (*Copies for distribution.*)

From Denver Chamber of Commerce and Board of Trade, Denver, Colo.:

Reports on the Feasibility of Establishing Slaughter Canning and Packing-Houses, with Manufactures incident thereto, in the City of Denver for the year 1885.

Annual Report of the Commissioner of Indian Affairs for the year 1884.

Report on the Leather and Shoe Industries, December, 1885.

Report of the Superintendent of Indian Schools for the year 1884.

Eleventh Annual Report of the Board of Education of District No. 1, Arapahoe County, Colo., September 1, 1885.

Twenty-eighth Annual Report of the Trade and Commerce of Milwaukee for the year ending December 31st, 1885.

The Chamber of Commerce Journal, Volume V, No. 47, January 5th, 1886.

The American Brewers' Gazette, May, 1886.

The Reporter, April, 1886.

Colorado Horticultural Report for the year 1885.

Second and Third Annual Reports of the Denver Chamber of Commerce and Board of Trade, Denver, Colo., for the years ended December 31st, 1884 and 1885.

Reports on the Commerce, Manufactures of their Consular Districts, etc., April, 1886.

Address by Hon. N. P. Hill on Silver Coinage.

Speech of Hon. G. G. Symes, of Colorado, April 7, 1886, on Silver Coinage.

From Denver Society of Civil Engineers, Edmund S. Davis, Secretary, Denver, Colo.:

Some Answers to Questions likely to be asked by the Members of the American Society of Civil Engineers during their visit to Denver on the occasion of their Annual Convention, July 2d, 1886.

From Edward B. Dorsey, New York City:

Seventeenth to Twenty-second Annual Report of the Chicago, Milwaukee and St. Paul Railway Company.

Report of Mr. Russell Aitken on Vyrnwy Masonry Dam.

Report of Mr. Arthur Hill Holme, on the Vyrnwy Water-works.

Report of Major-General Sir Andrew Clark on the Vyrnwy Masonry Dam.

Report of the Directors of the Chicago, Burlington and Quincy Railroad Company for the years 1860 to 1885, lacking 1861, 1868, 1875 and 1880.

The Tenth to Fourteenth Annual Reports of the Board of Directors of the New York, New Haven and Hartford Railroad Co.

The South Mountain Water Co.'s Proposition to the Councils of the City of Philadelphia to leave the Water-works and Construct a new system of Water Supply for the City of Philadelphia.

Thirty-ninth Annual Report of the Board of Directors of the Pennsylvania Railroad Company to the Stockholders. Presented at the meeting held March 9th, 1886.

Register of the Commissioned and Warrant Officers of the Navy of the United States, including Offiers of the Marine Corps, to January 1st, 1886.

Report of the Commissioner of Public Works of New York City to the Aqueduct Commissioners, Supplementary to his Report of August 8th, 1883.

Report of Isaac Newton Chief Engineer of Croton Aqueduct, on Plans proposed for Storing and Conveying an Additional Water Supply to the City. Opinions of the Con-

sulting Engineers, Tables of Rainfall, Maps showing Drainage Area and Aqueduct Lines.

From W. F. Durfee, New York City:

The Mitis Process of Producing Wrought-Iron and Steel Castings.

From Dyckerhoff & Sohne, Amoeneberg, Germany:

Minutes of the Ninth General Meeting of the German Cement Manufacturers, February, 1886.

From N. W. Ellis, Manchester, N. H.

La Lumière Electrique son histoire, sa production et son emploi. Par Em-Alglave et J. Boulard.

From Engineers' Society of Western Pennsylvania, Pittsburgh, Pa.

Eads' Proposed Ship Railway across the Isthmus of Tehuantepec.

Long Distance Transportation of Natural Gas.

Pittsburgh Testing Laboratory,

Specifications for Material and Workmanship of Structures of Iron and Steel. Alfred E. Hunt.

From John M. Goodwin, Sharpsville, Pa.:

Profiles Boston to Hudson River, three routes:

1. *Via* Troy and Greenfield, "Hoosac Tunnel" Route.
2. *Via* Springfield and Pittsfield, Boston and Albany Route.
3. *Via* Willimantic and Hartford.

From George S. Greene, Jr., New York City:

Address to the Public on the advisability of purchasing Belle Isle for a Park, Waterworks, and Basis for a Tunnel.

Report of the Medical Commission of the City of Boston upon the Sanitary Qualities of the Sudbury, Mystic, Shaushine and Charles River Waters.

Fourth and Fifth Report upon the Improvement of the South Pass of the Mississippi River, showing condition of the works on August 17, 1876, and November 18, 1876.

Report on the Jetty System as applied to the Channel of Entrance to Cumberland Sound. Gen. Q. A. Gillmore.

Eighth Annual Report of the Board of Harbor Commissioners. January, 1874

Report on the proposed Chesapeake Bay and Potomac River Tide Water Canal from Washington to Annapolis. S. H. Sweet.

Prospectus of the New York, Housatonic and Northern Railroad Company. 1864.

Certificate of Incorporation, By-Laws and Prospectus of the Earth-Boring Machine Co. 1868.

Report of the Water Commissioners of the City of Albany, N. Y., for the years 1864 to 1867; also Review of the Water Commissioners' Report for 1856.

Statements of H. Haupt on the Troy and Greenfield Railroad, Cambridge, Mass., January 31, 1862.

Physics and Hydraulics of the Mississippi River. St. Louis, February 19, 1876.

Annual Report upon the Improvement of Rivers and Harbors in the States of New York (including the Removal of Obstructions at Hell Gate) and New Jersey.

Report on the Improvement of the South Pass of the Mississippi River.

R. A. Hill's Stop and Branch for Street Mains and Multiple Fire Plugs.

Design for a Bridge across the East River, New York, at Blackwell's Island.

Majority Report of the Committee on Water and Union of Mystic and Cochituate Water Boards.

Abstract of the Discussion upon a paper on American Iron Bridges, submitted by Zerah Colburn.

Proceedings of the Seventh Annual Convention of the American Institute of Architects, held in Chicago October 15th, 16th and 17th, 1873.

Report from the Engineers to the Metropolitan Commissoners of Sewers.

Reports, etc., of District Engineers of the working of Pipe Sewers.

Reports on the State of the Works of Drainage and Sewerage of Croydon.

Reports of Survey as relating to House Drainage and Water Supply.

Van Nostrand's Eclectic Engineering Magazine, Vols. I, II and III bound: volumes IV to XV unbound; January to April, 1877, of Vol. XVI.

From S. S. Guthrie, Buffalo, N. Y.:

Address before the Merchants' Exchange of Buffalo, N.Y., on the Great Northern Transportation Route between the Atlantic and Pacific. S. S. Guthrie.

From William Hamilton, Toronto, Canada:

Annual Report of the Toronto Water-works for the year ending 31st December, 1885.

From Charles A. Hinckeldeyn, Technichal Attaché, Imperial German Legation, New York City:

Die Bestimmung von Normal Profilen fur die Elbe von der Sarhsisch-preussischen Grenze bis Geesthacht. Mit Atlas.

From John R. Hudson:

Tables for Calculating the Cubic Contents of Excavations and Embankments by an Improved Method of Diagonal and Side Triangles.

From Institution of Civil Engineers, James Forrest, Secretary, London:

On the Antiseptic Treatment of Timber. Samuel Bagster Boulton. (With an abstract of the discussion upon the paper.)

List of Members of the Institution of Civil Engineers, 3d June, 1886.

On the Explosion of Gaseous Mixtures. Dugald Clark. With an abstract of the discussion upon the paper.

On the Wear of Steel Rails. Harry Footner.

Sewer Ventilation. George R. Strachan.

Recent Researches in Friction. John Goodman.

The Economical Construction of Railways. Robert Gordon, James Robert Morse, Granville Carlyle Cunningham. With an abstract of the discussion upon the paper.

English and American Railroads Compared. Edward Bates Dorsey.

Experiments on the Discharge of Water of Different Temperatures. John George Mair.

On Rail Joints and Steel Rails. Christer Peter Sandberg.

On the Rate of Hardening of Cement and Cement-Mortars. Prof. Wm. Cawthorne Unwin.
The Strength of Steel and Wrought-Iron Girders. Abstract from a Report to the Dutch Minister of Public Works.
The Granada Earthquake of 25th December, 1884. Edward J. T. Manly.
Water Purification: its Bi-Logical and Chemical Basis. Percy F. Frankland. With an abstract of the discussion upon the paper.
The River Seine. Leveson Francis Vernon Harcourt. With an abstract of the discussion upon the paper.
On Gas Producers. Frederick John Rowan. With an abstract of the discussion upon the paper.
The Injurious Effect of a Blue Heat on Steel and Iron. C. E. Stromyer. With an abstract of the discussion upon the paper.
Abstracts of Papers in Foreign Transactions and Periodicals.
Proceedings. Vols. LXXXIV and LXXXV, 1885–86, Parts II and III.

From Hon. John J. Ingalls, Washington. D. C.:
Speech of Hon. John J. Ingalls, of Kansas, on Relations between the Senate and Executive Departments.

From Wm. A. Jefferis, New York City:
The Naturalist's Leisure Hour and Monthly Bulletin for January, February, March and April, 1886.

From John Kennedy, Montreal, Canada:
Annual Report of the Harbor Commissioners of Montreal for the year 1885.

From Louis H. Knapp, Buffalo, N. Y.:
Seventeenth Annual Report, Buffalo City Water-works. 1885.

From J. F. Le Baron, Jacksonville, Fla.:
Map of the City of Jacksonville and Suburbs, Duval County, Florida.
An Article on the Hydraulics of the Okeechobee Region, Florida.

From Louis Lesage, Montreal, Canada.
Annual Report of the Superintendent of the Montreal Water-works for the year ending 31st December, 1885.

From Wm. J. McAlpine, Bay Ridge, N. Y.:
Ten Sheets, showing Plans of Harlem Bridge.
Form of Proposals.
Specifications for its Construction. 1886.
Memorandum of Verbal Information given to various Persons who have asked Questions in regard to the Plans, Specifications, etc.

From John MacLeod, Louisville, Ky.:
Two Photographs of the Kentucky and Indiana Bridge.

From Capt. O. E. Michaelis, U. S. A., West Troy, N. Y.:
The Application of Electricity to the Development of Markmanship.

From H. C. V. Moller, Copenhagen, Denmark:
Beskrivelse af det i Nordamerika anvendte Materiel til Uddybring. I. Flode rog Havne.

From George S. Morison, New York City:
Specifications for Superstructure for Bridge across the Missouri River at Rulo, Nebraska.
Tenth Census of the United States. Volumes I to XIV, lacking Volume XII.
Compendium of the Tenth Census. Parts I and II.

From Robert C. Morris, Nashville, Tenn.:
Annual Report of the Nashville, Chattanooga and St. Louis Railway. July 1, 1885.

From Gen. John Newton, Chief of Engineers U. S. A., Washington, D. C.:
Statement Showing Rank, Duties and Address of the Officers of the Corps of Engineers.
Report Relative to the Condition of the Aqueduct Bridge.
Report on the River and Harbor Bill for the Improvement of the Navigation of the Mississippi River.
Report Calling for Information Relative to the Erection of Fish-Ways at the Great Falls of the Potomac.
Report for the Construction of a Bridge Across the Potomac River.
Advertisements, Specifications and Proposals for Improvement of Rivers Emptying into San Pablo and Sisuun Bays.
For Improvement of Harbor Grand Haven, Mich.
For Building One Steam Launch for the Harbor of Refuge, Lake Huron.
For Office Supplies U. S. Engineer's Office, Cincinnati, Ohio.
For a New Tin Roof for the Executive Mansion.
For Dredging at Five Mile Bar, above Peltry's Island.
For Dredging Portland Harbor, Maine.
For Constructing Dike between Hog and Maiden Islands.
For a Concrete Block for Sandy Bay, Mass.
For Repairing Snag-boat.
For Iron and Steel Dam at Beattyville, Ky.
For Timber and Piles for Dam at Beattyville, Ky.
For Removal and Landing of Wreck of Schooner "Waldemar," now lying in Belfast Harbor, Me.
For Irons for Gates of Lock No. 6, Great Kanawha River, W. Va.
For Furnishing and Placing Stone in the Gap at the Delaware Breakwater.
For the Removal of the Wrecks of the Brig "Clio," and Steamer "North Heath."
For Dredging Racine Harbor, Wis.
For Hire of Dredge for Improving Port Chester Harbor, N. Y.
For Wrought-Iron Spikes Dam at Beattyville, Ky.
For the Upper Works, Cabin, etc., of a Steel and Iron Snag-boat.
Report relative to Appropriation for Breakwater at Port Orford, Oregon.
Report submitting an Additional Estimate for Repairs of Works at Olcott Harbor, N. Y., rendered necessary by damage caused by recent storms.
Report relative to the condition of the Government Works near Battery Island Light.
Report relative to the Construction of a Harbor of Refuge at Sandy Bay, Mass.
Report asking an Appropriation for Continuing Examinations and Surveys at South Pass, Mississippi River.

Report showing the Maintenance of the Channel of the Mississippi River.
Report of Major W. A. Jones on River Improvements in Oregon and Washington Territory.
An Estimate from the Secretary of War for the purchase of additional ground at Fort Hamilton, New York Harbor.
Specifications and Proposals as follows:
Harbor Improvement Muskegon, Mich.
Machinery for Tow-boat, for Louisville and Portland Canal.
Improvement of San Francisco Harbor, California.
Tow-boat for Louisville and Portland Canal.
Relating to Dredging in Annapolis Harbor, Maryland.
Removal of the Wreck of the Steamer "Dictator," now lying in the harbor at Tampa, Fla.
Stationery Supplies.
Rip-rap Stone, Ohio River.
Repairing Sand-Catch at Plum Island, Newburyport Harbor, Mass.
Building two Scows with Hoisters.
Coal for Louisville and Portland Canal, and Offices in Louisville, Ky.
Harbor Improvement, White River, Mich.
" " Manistee, "
" " Frankfort, "
Supplies and Material for Bridges.
Removal of Wreck off Cape Henlopen, Del.
Chains for Dam No 6, Great Kanawha River, W. Va.
Irons for Weir, etc., of Dam No. 6, Great Kanawha River, W. Va.
For Rip-rap Stone Dam at Beattyville, Ky.
For Improvement Harbor Saint Joseph, Mich.

From New York State Board of Health, Albany, N. Y.:
Monthly Bulletin, April, May, June and July, 1886.
Fifth Annual Report for 1885.

From New York Meteorological Observatory, Dr. Daniel Draper, Director, Central Park, New York City:
Abstracts of Registers from Self-Recording Instruments, January, February, March, April, May and June, 1886.

From Edward P. North, New York City:
Report upon Paving, etc., Certain Streets and Roads in the Borough of Birmingham, England, February 17, 1874.
Report on the Application of Science and Art to Street Paving and Street Cleansing of the Metropolis.
Communication from Board of Health relative to the Condition of the New Aqueduct, New York.
Fifth Annual Report of the State Board of Health of New York for 1885.
Record of Correspondence and Interviews between Jay Gould and the Officers of the Knights of Labor in reference to the late strike on the Missouri Pacific Railway Company.

From Albert F. Noyes, West Newton, Mass.:
Transactions of the New England Water-Works Association during the year 1885.

From Frank C. Osborn, Pittsburgh, Pa.:
Osborn's Tables of Moments of Inertia and Squares of Radii of Gyration.

From Charles Paine, Pittsburgh, Pa.:
Philadelphia Company's Yellow Book on Natural Gas.
Annual Report of the Philadelphia Company for 1885-86.

From Hon. Charles F. Peck, Commissioner, Albany, N. Y.:
Third Annual Report of the Bureau of Statistics of Labor of the State of New York for the year 1885.

From Franklin C. Prindle, East Orange, N. J.:
A Descriptive Catalogue of the Government Publications of the United States, September 5, 1774-March 4, 1881.

From Rand Drill Company, New York City;
One Instantaneous Photograph of Hell Gate, taken during Explosion of October 10, 1885.

From Railway Purchasing Agent Company, Chicago, Ill.:
The Official Railway List, 1886.

From Henry B. Richardson, New Orleans, La.:
Report of the Board of State Engineers of the State of Louisiana from April 20, 1884, to April 20, 1886.

From Frederic H. Robinson, Wilmington, Del.:
Fifteenth Annual Report of the Chief Engineer of the City to the Council for the year 1885.

From Andrew Rosewater, Omaha, Nebraska:
Annual Report of the City Engineer of the City of Omaha, April 1, 1885, to April 1, 1886.

From Collingwood Schreiber, Ottawa, Canada;
Profile of the Canadian Pacific Railway west of Lake Superior, in comparison with the Northern, Union and Central Pacific Railways.
Railway Statistics of Canada, 1884-85.

From T. Guilford Smith, Buffalo, N. Y.:
Statistics of the Trade and Commerce of Buffalo, 1885.

From Hamilton Smith, Jr., London, England:
Hydraulics: The Flow of Water through Orifices, over Weirs, and through Open Conduits and Pipes. Hamilton Smith, Jr. Vol. I, Text. Vol. II, Plates. London and New York, 1886.

From Smithsonian Institution, Washington, D. C.:
Annual Report of the Board of Regents of the Smithsonian Institution for the year 1884.

From Society of Engineers, Charles Julian Light, Secretary, London, England:
Transactions for 1885.

From A. J. Stevens, Gen. Master Mechanic Southern Pacific Co., Laer, Cal.:

Blue Prints of two heavy Locomotives now in use on Southern Pacific Company. Pacific System.

From Prof. George F. Swain, Boston, Mass.:

Tenth Census Report for 1886. Vol. XVI, Water Power, Part I.

From Prof. A. N. Talbot, Champaign, Ill.:

Report of the First Annual Meeting of the Illinois Society of Engineers and Surveyors, held at Champaign, Ill., Feb. 10th, 11th and 12th, 1886.

From Benjamin Thompson, Urbana, Ohio:

Seventh Annual Report of the Ohio Society of Surveyors and Civil Engineers, 1886.

From John C. Trautwine, Philadelphia, Pa.:

The Civil Engineer's Pocket Book for 1886.

The Field Practice of Laying out Circular Curves for Railroads.

From Union Bridge Company, New York City:

Four Photographs of the Kentucky and Indiana Bridge.

From United States Geological Survey, Washington, D. C.:

Monographs of the United States Geological Survey. Vol. IX.

Bulletin of the U. S. Geological Survey. Nos. 24, 25 and 26.

From United States Naval Observatory, Washington, D. C.:

Astronomical and Meteorological Observations made during the year 1882 at the United States Naval Observatory.

Papers on Squadrons of Evolutions and the Recent Development of Naval Material, June, 1886.

From Frederick W. Vaughan, Louisville, Ky.:

Louisville and Nashville Railroad Company. Sheets showing Performance of Engines and Cost per Mile Run for the Months of April to December, 1885, and from January to March, 1886.

Annual Report of the Louisville and Nashville Railroad Company for 1875, 1878–79, and 1881 to 1885.

From Lieut. Anthony W. Vogdes, U. S. A., Governor's Island, N. Y.:

Notes on the Distribution of Iron Ores in the United States.

Ordnance Notes, as follows:

Geometrical Solution of the Problem of the Trajectory of a Projectile in Vacuo. Prof. A. G. Greenhill.

Mars-la-Tour and Gravelotte. Lieut. John Bigelow.

Fabrication of 8-inch Eureka Projectiles. Henry D. Borup.

Puddled *vs.* Cast-Steel as Metal for Gun Hoops. Lieut. Rogers Birnie.

The Eighty-Ton Steam Hammers of Creusot and St. Chamond. S. Crispin.

Krupp Experiments. Reports III and XLVII.

Field Artillery. Capt. D. T. A. De Sotomayor.

Paints and Lacquers for Artillery Material.

Practical Instructions in Gunnery.

Improved Capstan. Henry Metcalfe.

Target Practice—Information for Soldiers. Col. Guy V. Henry.

Machines for the Physical Tests of Metals. Lieut. W. M. Metcalfe.

Synopsis of the Principal Points in the Theory of the Probability of Fire. E. Jouffret.

The Hawaiian Islands and People. Capt. C. E. Dutton.

Stencil Outfit. D. W. Flagler.

Report on Transcontinental Railways 1883. Gen. O. M. Poe.

Strategical Value of the Inland Canal Navigation of the United States. First Lieut. Tasker H. Bliss.

Wild-Fowl and Punt Guns. Major W. McClintock.

The Trajectories, Time of Flight, Remaining Velocities and Striking Energies of Bullets Fired from Large Bow and Express Rifles. Major W. McClintock.

Comparative Table of Austrian, English, French, German, Italian, and Russian Field Guns. Major S. C. Pratt.

The Manufacture of Steel and Its Application to Military Purposes. Captain G. Mackinley.

Field Artillery Fire.

United States Life-Saving Service. D. A. Lyle.

Meteorological Investigations. Capt. O. E. Michaelis.

A Peculiar Phase of Metallic Behavior. Capt. O. E. Michaelis.

Electrical Units of Measurement. Sir William Thomson.

Electricity Applied to Explosive Purposes. Prof. F. A. Abel.

Statistics of Mines and Mining in the States and Territories West of the Rocky Mountains.

From Prof. J. A. L. Waddell, Phœnixville, Pa.:

An Address delivered by Prof. Waddell before the Members of Kogakukyokai, Tokio, Japan.

American *versus* English Methods of Bridge Designing. (Reprinted from the *Japan Mail.*)

From Edmund B. Weston, Providence, R. I.:

Rain-Gauge Investigations.

Bulletin of the New England Meteorological Society for March, 1886.

From George M. Wheeler, Capt of Engineers' U. S. Army, Washington, D. C.:

Report upon the Third International Geographical Congress and Exhibition at Venice, Italy, 1881.

From William H. Wiley, New York City:

The Pennsylvania Railroad: Its Organization, Construction and Management. James Dredge.

Resources of Southwest Virginia, showing the Mineral Deposits of Iron, Coal, Zinc, Copper and Lead. C. R. Boyd.

From other sources:

Report of the Hon. John Bigelow on the Inspection of the Panama Canal in February, 1886.

MEMOIRS OF DECEASED MEMBERS.

JAMES DEWEY BURR, M. Am. Soc. C. E.

DIED MAY 5TH, 1886.

James Dewey Burr was born at Allen, Allegany County, New York, August 31st, 1843. He lost his mother in early youth, and at the age of twelve he went to the home of a relative in Michigan. His father is still living.

Although not yet eighteen years of age, Mr. Burr enlisted in April, 1861, in the 4th Michigan Infantry, and was in the army three years. His health never recovered from the results of the exposure to which he was subjected during that period.

Entering the University of Michigan, he graduated as a Civil Engineer in 1871, and directly afterward entered the engineer service of the Flint and Pere Marquette Railway. He was next engaged upon the Cincinnati Southern Railway until March, 1877, when he was appointed Superintendent of Bridges and Buildings of the Atchison, Topeka and Santa Fé Railway. In June, 1878, he went to Colorado as Assistant Chief Engineer and Superintendent of Construction of the lines of the same road from La Junta, Colorado, to Las Vegas, New Mexico. This line passes over the Raton Mountains. After the construction of these lines, Mr. Burr did some work in New Mexico and Arizona, and then, resigning his connection with the railway, he formed a partnership with Mr. B. Lantry, at Topeka, Kansas, and engaged actively in railway construction and bridge-building. He has resided at Topeka continuously since that time. He was President of the First National Bank of that city.

Mr. Burr was a careful and thorough engineer, and an authority in bridge construction. He was deeply devoted to his profession, and took great interest in engineering works even after failing health prevented an active participation in them.

In October, 1877, Mr. Burr was married to Miss Jennie Van Fleet, of White Pigeon, Michigan, who, with a young son, survives him. Mr. Burr was greatly respected in the city where he resided. His life was characterized by integrity and energy. He had much equanimity of character, and his associations in business and social life were remarkably strong.

A paper written by Mr. Burr was presented at the Annual Convention of the American Society of Civil Engineers in June, 1879, and published in the Transactions for October of that year. The subject was the Construction of the Atchison, Topeka and Santa Fé Railroad over the Raton Mountains, and the performance of locomotives over its steep grades. The paper was ably written, excellently illustrated, and excited much interest.

Mr. Burr became a member of the American Society of Civil Engineers April 5th, 1876.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. XII.—September, 1886.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

SEPTEMBER 1ST, 1886.—The Society met at 20 o'clock, Vice-President Thomas F. Rowland in the chair; John Bogart, Secretary. Ballots were canvassed, and the following candidates declared elected. As Members: Josiah Ackerman Briggs, New York; Carl Waldemar Buchholz, New York; Francis Eave Butterfield, San Antonio, Texas; Alfred Epher Hunt, Pittsburgh, Pa.; Jones Mumford Jackson, Wynne, Ark.; Charles Leonard Rowland, Brooklyn, N. Y.; Thomas Fitch Rowland, Jr., Brooklyn, N. Y.; William Rumble, Bayonne, N. J.; Frank Woodward Skinner, Buffalo, N. Y.; William Johnston Sproule, Montreal, Canada; Thomas Mann Randolph Talcott, Mobile, Ala. As Juniors: Edward Lorenzo Abbott, New York; William Clinton Brown, New York; William Cushing Edes, Boston, Mass.; George Robertson Hooper, Montreal, Canada; Montgomery Waddell, New York.

The death on August 18th, 1886, of Mr. E. S. Chesbrough, Past President Am. Soc. C. E., was announced; also the death on June 8th, of Richard M. Hoe, M. Am. Soc. C. E.

A crayon portrait of Mr. James Laurie, First President of the American Society of Civil Engineers, presented by Mr. William E. Worthen, M. Am. Soc. C. E., was exhibited.

The report of the Committee on the Compressive Strength of Cements and the Compression of Cements and Settlement of Masonry was read by the Chairman, Mr. F. Collingwood, M. Am. Soc. C. E., and discussed by Messrs. Dorsey, Emery, Flagg, Prindle and Collingwood.

Some remarks on Earthquakes were made by Messrs. R. L. Harris, Collingwood, Dorsey, and Emery.

SEPTEMBER 15TH, 1886.—The Society met at 20 o'clock, Vice-President Rowland in the chair; John Bogart, Secretary. A paper by Mr. John W. Hill, M. Am. Soc. C. E., on "A Masonry Dam," was read.

Some experiences of the recent earthquake at Charleston, S. C., were given by Mr. H. A. Duc, Jr., who was in that city at the time.

OF THE BOARD OF DIRECTION.

JUNE 9TH, 1886.—Applications were considered. The arrangements for the Convention were discussed. It was ordered, under the provisions of the By-Laws, that the meetings of the Society be suspended during July and August, except the business meeting to be held during the Convention. The resignation of Mr. William Metcalf as Chairman of Committee to Consider Changes in Organization was presented. Appropriations were made.

AUGUST 11TH, 1886.—Applications were considered. The following members were appointed a Board of Censors to award the Norman Medal: Messrs. Thomas C. Meyer, Frederic Graff and Charles E. Greene. The following members were appointed to be, with the Secretary, the Committee to award the Rowland Prize: Messrs. F. De Funiak and Frederick H. Smith.

The resolution adopted at the recent Convention in reference to changes in organization was considered, and the Secretary was directed to issue the resolution in circular form. Appropriations were made.

SEPTEMBER 1ST, 1886.—Applications were considered and appropriations made.

THE ROWLAND PRIZE.

CODE OF RULES FOR ITS AWARD.

Not more than one prize shall be awarded each year for papers presented during the year. The year shall terminate on the first day of August, and the award shall be announced at the annual meeting in January.

The prize shall consist of fifty dollars in cash.

The award shall be made by a committee consisting of the Secretary and two Members of the Society, to be appointed by the Board of Direction.

The prize shall be awarded to such paper as the committee deem most worthy of such recognition, the preference being given to papers describing in detail accomplished works of construction, their cost and manner of execution, and the errors in design and execution.

THE NORMAN MEDAL.

CODE OF RULES FOR ITS AWARD.

I.—Competition for the Norman Medal of the American Society of Civil Engineers shall be restricted to Members of the Society.

II.—There shall be one gold medal, and only one, struck for each and every fiscal year of the Society, and awarded as hereinafter provided. The dies therefor shall be with the Superintendent of the United States Mint at Philadelphia, in trust exclusively for the above purpose. Such medal shall be of a cost equal to the annual interest received upon $1 000 of the Consolidated Stock of the City of New York, Certificate No. 179, of the additional new Croton Aqueduct Stock of the City of New York, authorized by an Act of the Legislature of the State of New York, Chap. 230, passed April 15th, 1870, dated November 17th, 1873, now held in trust by the Treasurer of this Society, and so held solely for this purpose, and shall be executed upon his order.

III.—All original papers presented to the Society by Members of any class, during the year for which the medal is awarded, shall be open to the award, provided that such papers shall not have been previously contributed in whole or in part to any other association, nor have appeared in print prior to their publication by the Society, nor have been presented to the Society in any previous year.

IV.—The Board of Censors to award the medal shall consist of three Members of the Society, to be designated by the Board of Direction. The Secretary of the Society shall act as Secretary to the Board of Censors.

V.—The medal shall be awarded to such paper as the said Board shall judge to be worthy of special commendation for its merits as a contribution to engineering science, not merely relatively as compared with others presented during the same year, but as exhibiting the science, talent or industry displayed in the consideration of the subject treated of, and for the good which may be expected to result from the discussion and the inquiry.

VI.—In case no paper presented during the year shall be deemed of sufficient value to receive an award, the amount of the interest of the fund for that year shall be expended by the Board of Direction in the purchase of books, to be offered as a premium for the second best paper in the next year in which more than one paper of sufficient value may be presented.

VII.—The medal year shall terminate on the first day of August, and the award shall be announced at the annual meeting.

VIII.—The Treasurer of this Society shall cause the medal to be prepared and delivered to, or deposited to the order of, the successful competitor, within two months after the annual meeting at which the same shall have been awarded.

LIST OF MEMBERS.

ADDITIONS.

MEMBERS.		Date of Election.
Briggs, Josiah Ackerman	Fordham, New York City	Sept. 1, 1886.
Buchholz, Carl Waldemar	Engineer Bridges and Buildings New York, Lake Erie and Western R. R., 187 West street, New York City	Sept. 1, 1886.
Jackson, Jones Mumford	Assistant Engineer Missouri Pacific R. R., Wynne, Ark	Sept. 1, 1886.
Rowland, Charles Leonard	61 Morton street, Brooklyn, N. Y.	Sept. 1, 1886.
Rowland, Thomas Fitch, Jr.	Station G, Brooklyn, N. Y.	Sept. 1, 1886.
Rumble, William	Civil and Mechanical Engineer, Bayonne, N. J.	Sept. 1, 1886.
Skinner, Frank Woodward	1057 West avenue, Buffalo, N. Y.	Sept. 1, 1886.
Sproule, William Johnston	Assistant Engineer Montreal Harbor and Ship Channel Improvements, Montreal, Canada	Sept. 1, 1886.
Talcott, Thomas Mann Randolph	Superintendent Mobile and Ohio R. R., St. Louis, Mo.	Sept. 1, 1886.

JUNIORS.

Abbott, Edward Lorenzo	(Care Sooysmith & Co.) 2 Nassau street, New York City	Sept. 1, 1886.
Brown, William Clinton	86 Liberty street, New York City	Sept. 1, 1886.
Waddell, Montgomery	(Care J. A. L. Waddel), Phœnixville, Pa	Sept. 1, 1886.

DEATHS.

Chesbrough, E. S. ..... Past President; elected Member June 17, 1868; died August 18, 1886.

Hoe, Richard M. ..... Elected Member October 1, 1873; died June 8, 1886.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. XII.—October, 1886.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

OCTOBER 6TH, 1886.—The Society met at 20 o'clock, Vice-President Rowland in the chair; John Bogart, Secretary. Ballots were canvassed, and the following candidates declared elected as Members: Samuel George Artingstall, Chicago, Ill.; George Birdsall Cornell (elected Junior August 6, 1879), Brooklyn, N. Y.; Benjamin Lincoln Crosby, (elected Junior June 2, 1880), Rulo, Neb.; James Gustavus Dagron, Pittsburgh, Pa.; Stephenson Waters Fox (elected Junior July 7, 1880), St. Joseph, Mo.; Frederick William Doane Holbrook, Glendive, Mont.; George Anthony Lederle (elected Junior May 2, 1883), Omaha, Neb.; Leonor Fresnel Loree, Logansport, Ind.; Sampson Douglas Mason, St. Paul, Minn.; Robert John McClure, Denver, Colo.; James Henry Morley, St. Louis, Mo.; Thomas O'Neill Morris, Indianapolis, Ind.; Henry Cuyler Parsons, Albany, N. Y.; Alfred Petry, Covington, Ky.; Hugh Tudor Richards, Guaymas, Sonora, Mex.; Francis Morris Rutherford, Bordentown, N. J.; John Henderson Sample, Salina, Kas.; Julius William Schaub (elected Junior November 5, 1884), Montreal, Can.; Richard Willette Sherman, Utica, N. Y.; Miller Armstrong Smith, Brooklyn, N. Y.; John Frothingham Ward, New York City. As Associates: Frank W. Handy, Cincinnati, O.; Robert Cochran McKinney, Hamilton, O. As Juniors: Edward Marshall Boggs, Colorado Springs, Colo.; Francis Denis Hubert Lawlor, Burlington, Iowa.

It was announced that, under the rules, Messrs. T. C. Meyer, Frederic Graff and Charles E. Greene had been appointed the Board of Censors to award the Norman Medal; also that Messrs. Frederick De Funiak, Frederick H. Smith, and Secretary John Bogart, had been appointed the Committee to award the Rowland Prize.

A paper by Arthur D. Foote, M. Am. Soc. C. E., on A Water Meter for Irrigation was read and discussed.

A discussion by S. Whinery, M. Am. Soc. C. E., on Excessive Rainfall was read, and the subject was discussed.

OCTOBER 20TH, 1886.—The Society met at 20 o'clock, Vice-President Rowland in the chair; John Bogart, Secretary. The death on October 4th, 1886, of George H. Elliott, M. Am. Soc. C. E., was announced.

A paper by Charles E. Emery, M. Am. Soc. C. E., on a Clamp for Pulling Sheet Piling was read and discussed.

A paper by the same writer, on a Novel Application of the Polar Planimeter, presented at the last Convention, was discussed.

An interesting collection of exhibits illustrating phases of the recent earthquake at Charleston, S. C., sent by H. C. Duc, Jr., was presented, with an explanatory letter from that gentleman.

OF THE BOARD OF DIRECTION.

OCTOBER 6TH, 1886.—Applications were considered. Letters from a number of foreign engineers desiring to join the Society were presented, and the subject referred for consideration. Three replies to the circular in reference to proposed changes in the organization of the Society were considered. Appropriations were made.

MEMOIRS OF DECEASED MEMBERS.

EDWARD AUSTIN FLINT, M. Am. Soc. C. E.

DIED JANUARY 23D, 1886.

Edward Austin Flint was born in Boston, January 30th, 1832, and died of pneumonia in Brookline, January 23d, 1886. He was the only son of Dr. John Flint, an eminent physician of Boston, and of a family that has given many notable men to the medical profession. After the usual five years' course in the Boston Public Latin School, he entered Harvard College in 1847, and graduated in 1851 with the degree of Bachelor of Arts, being the youngest member of his class. He then

entered "The Lawrence Scientific School," and left it in August, 1852, to enter upon the practical work of his chosen profession of civil engineering, beginning work as rodman of a construction party on the Ohio Central Railroad.

In August, 1853, he was called to the London and Port Stanly Railway in Canada, as Assistant Engineer, at first employed on surveys, and later as assistant on construction, and he remained on the road until its completion in January, 1857.

In the following April he was appointed Assistant Engineer on the Lansing and Francis Bay Railroad in Michigan.

Being appointed Resident Engineer of the Copiapo Railroad Company in August of the same year, he left for Chili to take charge of the extension of the road from Pabellon to Chañarcillo.

After completing this work, he made, in March, 1859, a barometrical and instrumental survey of the San Francisco pass of the Cordillera, starting from the Copiapo Valley and passing up the Paipote Valley. This was a distinguished service, and was ably performed, his report of this work being read before the Royal Geographical Society of England, where it excited much interest.

He made a visit to the United States in 1859, returning later in the same year to Chili, and was for some time interested in contracting on the Copiapo Road.

In 1861 he was associated with Mr. Henry Meiggs on the Santiago and Valparaiso road in Chili, and left there in the spring of 1862 for the United States, with the intention of entering the army. In the following autumn he was commissioned as Second Lieutenant in the First Massachusetts Cavalry. He was present at the battle of Fredericksburg, and also at Gettysburg, and, with his command, was engaged in a number of actions of minor importance, his company losing heavily, although he himself was so fortunate as only to be wounded once, and that slightly. From March, 1864, to the end of the war, he was attached to Gen. Meade's escort, and was in command of it towards the last, taking part in many memorable events, and being present at the famous review in Washington, the closing scene of the war. His rank when mustered out was Major, and he afterwards was breveted Colonel for brave and meritorious services during the war.

Colonel Flint's services throughout the war were notable for able administration of the delicate duties connected with his position upon the staff of the General in command, and for untiring solicitude for the welfare of his men, and for personal courage in service. His General and his companions in arms speak of him in enthusiastic and laudatory terms. After the close of the war he went to California, early in 1866, and was there engaged in making surveys of projected roads, and late in the year he accepted the position of one of the trustees of the Union Copper Mine at Copperopolis, and afterwards became its President.

Early in 1868 he was engaged on the Floating Dock at Hunter's Point, and later in the year made the surveys for the Los Angeles and Wilmington Railroad, and after its construction he remained for some time in charge as Superintendent.

In 1870 he was appointed Chief Engineer of the Western Division of the Northern Pacific Railroad, with headquarters at Portland, Oregon, and as such he had charge of the surveys in the State of Oregon, and in Washington, Idaho, and Montana Territories.

In 1871 he undertook exploration and preliminary surveys in the Indian Territory for the Atlantic and Pacific Railroad.

In April, 1872, he returned to South America as Chief Engineer of the Juliaca and Cuzco Railroad in Peru, having charge of the location of the road and of its construction so far as it was built.

In 1874 he became Superintendent of the Mollendo and Arequipa and of the Arequipa and Puno Railroads, and held those positions until 1877, when he returned to the United States.

In 1878 and 1879 he was Division Engineer in charge of construction in Nebraska on the Burlington and Missouri River Railroad, and was Chief Engineer of the Toledo, Cincinnati and St. Louis Railroad in 1883 and 1884.

In December, 1867, he was married to Miss Lucy Whitwell Parker, a daughter of the late William Parker, C. E., who with two sons and two daughters survive him.

Such is the mere skeleton, as a record of dates, and official appointments always is, of a career which needs in addition the flesh and blood of social and professional life, and of distinctive traits of character to constitute the man as he was known to his friends.

In his profession he leaves a long record of varied and responsible work ably performed. In the memory of those who knew him, and in the future lives of those whose youth was passed within the range of his personal influence, he leaves a monument scarcely less enduring.

Of the most sterling and spotless character, he himself knew no guile, and could hardly suspect it in another. His generosity and magnanimity left no room for malice or enmities, and his chivalry of sentiment and grace of manner were so thoroughly a part of the man that it was beyond the power either of prosperity or misfortune to affect them.

Colonel Flint was elected a Member of the American Society of Civil Engineers May 18th, 1870.

NOTE.—Committee preparing Memoir: James R. Maxwell, M. Am. Soc. C. E., and the Secretary.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. XII.—November, 1886.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

NOVEMBER 3D, 1886.—The Society met at 20 o'clock, Vice-President Rowland in the chair; John Bogart, Secretary. Ballots were canvassed and the following candidates declared elected. As Members: Alexander Gordon Brinckerhoff, Brooklyn, N. Y.; Chambers McKibbin Craig, Jeffersonville, Ga.; Wilbur Fisk McClure, Los Angeles, Cal.; William Lawrence Saunders, New York, N. Y. As Juniors: Christopher Newton Brown, Columbus, O.; Elijah Polhill Butts, Omaha, Neb.

A paper by Robert L. Harris, M. Am. Soc. C. E., Some Notes of a Recent Visit to the St. Lawrence Bridge Now Being Constructed at Lachine, Canada, was read and discussed. Remarks on the proposed drainage of the Valley of Mexico were made by Señor Gayol, City Engineer of the City of Mexico. Captain A. E. Piorekowski, of Germany, explained the principles, tests and efficiency of the Gruson type of chilled cast-iron armor for land batteries.

NOVEMBER 17TH, 1886.—The Society met at 20 o'clock, President Henry Flad, in the chair; John Bogart, Secretary.

A paper by Edward Bates Dorsey, M. Am. Soc. C. E., on Irrigation, was read and discussed.

OF THE BOARD OF DIRECTION.

NOVEMBER 10TH, 1886.—Applications were considered. The preparation of the Annual Report was directed. Appropriations were made. The subject referred to the Board by the last Convention, with communication in regard to reorganization, was considered.

LIST OF MEMBERS.

ADDITIONS.

HONORARY MEMBER. Date of Election.

DUANE, JAMES C.....Chief of Engineers, Bvt. Brig.-Gen., U. S. A., Washington, D. C.....Nov. 20, 1886.

MEMBERS.

ARTINGSTALL, SAMUEL GEORGE..City Engineer, Chicago, Ill.....Oct. 6, 1886.

CORNELL, GEORGE BIRDSALL ....(Elected Junior Aug. 6, 1879), Chief Engineer Brooklyn Elevated R. R., 49 Fulton st., Brooklyn, N. Y.....Oct. 6, 1886.

CRAIG, CHAMBERS MCKIBBEN....Dublin, Ga.....Nov. 3, 1886.

CROSBY, BENJAMIN LINCOLN.....(Elected Junior June 2, 1880), Resident Engineer Rulo Bridge, Rulo, Neb.....Oct. 6, 1886.

DAGRON, JAMES GUSTAVUS.....Chief Inspector of Bridges, Baltimore and Ohio R. R., Baltimore, Md.....Oct. 6, 1886.

FOX, STEPHENSON WATERS.....(Elected Junior July 7, 1870), U. S. Engineer's Office, St. Joseph, Mo.....Oct. 6, 1886.

GREEN, BENJAMIN DWIGHT.....P. O. Box 95, Savannah, Ga.....Nov. 4, 1885.

HOLBROOK, FREDERICK WILLIAM DOANE.....Division Superintendent Northern Pacific R. R., Glendive, Montana.....Oct. 6, 1886.

HUNT, ALFRED EPHER.....98 Fourth Ave., Pittsburgh, Pa..Sept. 1, 1886.

LEDERLE, GEORGE ANTHONY.....(Elected Junior May 2, 1883), Resident Engineer Omaha Bridge, Omaha, Neb.....Oct. 6, 1886.

LOREE, LEONOR FRESNEL.....Engineer Maintenance of Way 2d and 4th Division, Chicago, St. Louis and Pittsburgh Ry., Logansport, Ind.....Oct. 6, 1886.

MASON, SAMPSON DOUGLAS.....Principal Assistant Engineer Northern Pacific R. R., St. Paul, Minn.....Oct. 6, 1886.

MCCLURE, ROBERT JOHN.....Consulting Engineer, Chicago, Burlington and Quincy R. R., Denver, Colo.....Oct. 6, 1886.

MCCLURE, WILBUR FISK.....134 N. Main st., Los Angeles, Cal..Nov. 3, 1886.

		Date of Election
MORLEY, JAMES HENRY	Room 7, Temple Building, St. Louis, Mo	Oct. 6, 1886.
PARSONS, HENRY CUYLER	State Engineer's Office, Albany, N. Y.	Oct. 6, 1886.
PETRY, ALFRED	Assistant Engineer Kentucky Central Ry., Covington, Ky.	Oct. 6, 1886.
RUTHERFORD, FRANCIS MORRIS	Assistant Supervisor Pennsylvania R. R., Bordentown, N. J.	Oct. 6, 1886.
SAMPLE, JOHN HENDERSON	Chief Engineer Kansas and Colorado Ry., Salina, Kan.	Oct. 6, 1886.
SAUNDERS, WILLIAM LAWRENCE	Engineer Ingersoll Rock Drill Co., 10 Park place, New York City	Nov. 3, 1886.
SHERMAN, RICHARD WILLETTE	City Surveyor, 36 Broad st., Utica, N. Y.	Oct. 6, 1886.
SMITH, MILLER ARMSTRONG	224 Keap st., Brooklyn, N. Y.	Oct. 6, 1886.

ASSOCIATES.

HANDY, FRANK W	Minneapolis, Minn	Oct. 6, 1886.
MCKINNEY, ROBERT COCHRAN	Secretary and Assistant Manager Niles Tool Works, Hamilton, Ohio	Oct. 6, 1886.
STONE, WATERMAN	Superintendent Providence, Warren and Bristol R. R., Providence, R. I.	Dec. 1, 1886.

JUNIORS.

BOGGS, EDWARD MARSHALL	Colorado Midland Ry., Colorado Springs, Colo.	Oct. 6, 1886.
BROWN, CHRISTOPHER NEWTON	Assistant Professor Civil Engineering, Ohio State University, Columbus, Ohio	Nov. 3, 1886.
BUTTS, ELIJAH POLHILL	St. Cloud, Minn.	Nov. 3, 1886.
EDES, WILLIAM CUSHING	Assistant Engineer Southern Pacific Co., Berryvale, Cal.	Sept. 1, 1886.
HOPPER, JOHN JACOB	161 West 122d st., New York City	May 5, 1886.
LAWLER, FRANCIS DENIS HUBERT	Engineer Iowa Lines, Chicago, Burlington and Quincy R. R., Burlington, Iowa	Oct. 6, 1886.

CHANGES AND CORRECTIONS.

MEMBERS.

BAKER, WILLIAM H.....Resident Engineer Atchison, Topeka and Santa Fé R. R., New Kiowa, Kansas.

BALLARD, ROBERT.....Rockhampton, Queensland, Australia.

BARNARD, JOHN F.....President and General Manager Ohio and Mississippi Ry., Cincinnati, Ohio.

BELL, HENRY P.....Esquimault and Nanaimo Ry., Victoria, British Columbia.

BENYAURD, WILLIAM H. H.....Major Corps of Engineers U. S. A., San Francisco, Cal.

CARTWRIGHT, ROBERT.....237 Alexander st., Rochester, N. Y.

CHITTENDEN, SAMUEL H.....East River, Conn.

CLEMENT, FRANK H.....General Superintendent Juragua Iron Co., (Ltd.) Santiago de Cuba (208 South 4th st., Philadelphia, Pa.)

CROWELL, J. FOSTER.....Engineer of Construction Cincinnati and Richmond R. R., (Pennsylvania Co.) Room 6, Little Miami Depot, Cincinnati, Ohio.

DOANE, WALTER A.....Canadian Pacific R. R. Office, Sherbrooke, Quebec, Canada.

DORAN, FRANK C.....Indianapolis Union Ry. Co., Indianapolis, Ind.

EAYRS, NORMAN W.....(Care St. Louis Bridge and Tunnel R. R.) St. Louis, Mo.

FORNEY, MATTHIAS N.....23 Murray st., New York City.

FOUQUET, JOHN D.....Assistant Engineer and Superintendent Buildings New York, West Shore and Buffalo Ry., 444 West 57th st., New York City.

GOAD, CHARLES E.....53 New Broad st., London, E. C., England.

GOULD, E. SHERMAN.....Consulting Engineer Scranton Gas and Water Co., Scranton, Pa.

GRISWOLD, FRANK L.....Ferro-Carril de Buenos Aires a Marcedes (Clark & Co.), 31 Calle Rivadavia, Buenos Ayres, Argentine Republic.

HASELL, BENTLEY D.....(B. D. Hasell & Co.) 66 Pine st., New York City.

HUNT, RANDELL.....Waterloo, Iowa.

JENNINGS, WILLIAM T.....Engineer and Manager Construction Western Ontario Pacific Ry., London, Ontario, Canada.

MARR, GEORGE A.....U. S. Engineer's Office (P. O. Box H), St. Paul, Minn.

MCKEE, SAMUEL B.....Division Engineer Canadian Pacific R. R., Lenoxville, Quebec, Canada.

MOULTON, MACE.....Engineer of Bridges Colorado Midland R. R., Colorado Springs, Colo.

NICHOLS, OTHNIEL F.....Principal Assistant Engineer Suburban Rapid Transit Co., 845 East 164th st., New York City.

NOBLE, ALFRED.....Resident Engineer Harlem River Bridge, High Bridge, N. Y.

O'ROURKE, JOHN F.....Chief Engineer Union Bridge Co., in charge Poughkeepsie Bridge, Poughkeepsie, N. Y.

OSGOOD, JOSEPH O.....Chief Engineer Toledo, St. Louis and Kansas City R. R., Toledo, Ohio.

PAINE, ARTHUR B.....Chief Engineer Manhattan Bridge Building Co., Poughkeepsie, N. Y.

PARKHURST, HENRY W.....(Care Geo. S. Morison), 35 Wall st., New York City.

RICHARDSON, THOMAS F.....2217 Champa st., Denver, Colo.

ROWE, SAMUEL M.....Resident Engineer Atchison, Topeka and Santa Fé R. R., 261 Topeka ave., Topeka, Kansas.

SAWYER, CHARLES H.....Assistant Engineer Union Pacific Ry., Stanberry, Mo.

SEARS, CLINTON B.....Capt. Corps of Engineers U. S. A., Bismarck, Dakota.

SIMPSON, GEORGE H.....Terre Haute, Ind.

SKINNER, FRANK W.....(Care Pottsville Iron and Steel Co.) Pottsville, Pa.

SMITH, W. HARRISON.....Engineer American Manganese Co. (Ltd.) Mushet P. O., Augusta Co., Va.

STALEY, CADY.....President Case School Applied Science, Cleveland, Ohio.

STEARNS, FREDERIC P.....Chief Engineer State Board of Health, 13 Beacon st., Boston, Mass.

STANTON, ROBERT B.....Flint, *via* Silver City, Idaho.

STRIEDINGER, JULIUS H.....(Care Paul Lorent, German Consul), Bucaramanga, Santander, U. S. Colombia.

THACKRAY, GEORGE E.....Superintendent Columbus Steel Co., Columbus, Ohio.

WARE, R. WILLARD.....Plainfield, N. J.

WALLACE, JOHN F.....Assistant Engineer Union Pacific Ry., Fort Steel, Wyoming.

WALKER, J. S.....Box 16, Birmingham, Ala.

WARDLAW, JAMES R.....25 Chambers st., Room 25, New York City.

WATKINS, FREDERICK W.....Superintendent Construction Ohio Valley Ry., Henderson, Ky.

WHEELER, LEVI L.....2828 Washington ave., St. Louis, Mo.

ASSOCIATES.

ANDREWS, EDWARD R .....Equitable Life Assurance Co., Boston, Mass.
DANA, JAMES J.... .....Lt.-Col., Bvt. Brig.-Gen. U. S. A., President Hastings Pavement Co., 1913 J st., Washington, D. C.
PHILLIPS, HENRY A..... .....Division Superintendent Fitchburg R. R., Worcester, Mass.

JUNIORS.

BRERETON, THOMAS J .....Assistant Supervisor Pennsylvania R. R., Monongahela, Pa.
DAY, G. FREDERICK P.....Los Angeles, Cal.
HAINES, CASPER W.....(Care R. B. Haines), Cheltenham, Pa.
HAVILAND, ARTHUR .....Assistant City Engineer, San Antonio, Texas.
SEAMAN HENRY B.....3205 Baring st., Philadelphia, Pa.
STARR, WILLIAM H.....Superintendent's Office Eastern Div. New York, Lake Erie and Western R. R., Jersey City, N. J.
WEISKOPF, SAMUEL C .....(Care Keystone Bridge Co.), Pittsburgh, Pa.
YOUNG, HERBERT A .....Division Engineer Toledo, St. Louis and Kansas City R. R., Frankfort, Ind.

DEATHS.

CORYELL, MARTIN.....Elected Member December 4, 1867; died November 30, 1886.
ELLIOTT, GEORGE H.....Elected Member April 4, 1883; died October 7, 1886.
EVANS, WALTON W.....Elected Member December 4, 1867; elected Fellow March 15, 1870; died November 28, 1886.

American Society of Civil Engineers.

PROCEEDINGS.

Vol. XII.—December, 1886.

MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

OF THE SOCIETY.

DECEMBER 1ST, 1886.—The Society met at 20 o'clock, Vice-President Rowland in the chair; John Bogart, Secretary. Ballots were canvassed and the following candidates declared elected. As Members: William Jewett Haskins (elected Junior March 7th, 1883), New York City; William Chatlin Wetherill, Liberty, Mo. As Associate: Waterman Stone, Providence, R. I. As Junior: Ralph Modjeski, Omaha, Neb.

The death on November 28th, 1886, of Walton White Evans, M. Am. Soc. C. E., and F. Am. Soc. C. E., and the death on November 30th, 1886, of Martin Coryell, M. Am. Soc. C. E., were announced.

The report of the Committee on the Compressive Strength of Cement and Settlement of Masonry, which was presented at the Annual Convention, was discussed.

A paper by Henry Faija, C. E., on Portland Cement Testing, was read and discussed. A paper on the Effect of Freezing on Cement-Mortar, by Alfred Noble, M. Am. Soc. C. E., was read and discussed.

Mr. Edward P. North, M. Am. Soc. C. E., exhibited and described some of the tubes used and proposed to be used in electrical subways.

DECEMBER 15TH, 1886.—The Society met at 20 o'clock, Mr. E. B. Van Winkle in the Chair; John Bogart, Secretary.

A paper by R. E. McMath, M. Am. Soc. C. E., on the Determination of the Size of Sewers, was read. A paper by James B. Francis, Past President Am. Soc. C. E., on the Stoppage of Flow in Water Mains by Anchor Ice, was read and discussed.

OF THE BOARD OF DIRECTION.

DECEMBER 8TH, 1886.—Applications were considered. Action was taken as to the issue of a circular in accordance with resolution adopted at the Denver Convention in reference to Changes in the Organization of the Society. Action was taken in reference to methods of ventilating the building and in reference to securing the professional records of Members whose records are not upon the files of the Society.

Arrangements for the Annual Meeting were made and a committee appointed on the subject. Appropriations were made.

MEMOIRS OF DECEASED MEMBERS.

HENRY MORSE WIGHTMAN, M. Am. Soc. C. E.

DIED APRIL 3D, 1885.

Henry Morse Wightman, born in Boston, Mass., January 5th, 1840, was the son of Joseph Milnor and Bethiah (Morse) Wightman. His father was a well known maker of philosophical instruments, was Mayor of Boston in 1861 and 1862, and subsequently became a member of the Bar.

Henry M. Wightman was educated in the Boston Public Schools, graduating at the English High School in 1857. Shortly afterward he entered the City Engineer's Office as rodman, James Slade then being City Engineer. He served for several years in a subordinate capacity upon the various engineering works of the city, such as the improvements of the bridges, water supply and public grounds. In 1861 and 1863 he made surveys in connection with the extension and protection of the water supply at Lake Cochituate, and in 1864 acted as engineer for the Back Bay Commissioners; but he was principally employed from 1860 to 1864 upon the Public Garden improvement, where he was in charge of the work as Assistant Engineer. From 1864 to 1870 he was chiefly occupied with the surveys and construction of the Chestnut Hill Reservoir, the largest and finest in the suburbs of Boston. He was Resident Engineer on this work from February 14th, 1866, till its completion in 1870. On his return to the city office in May, 1870, he was

Committee to prepare Memoir: William Jackson, Eliot C. Clarke and Fred. Brooks, Members Am. Soc. C. E.

appointed Assistant City Engineer, and remained in that position ten years. Upon the resignation, in 1880, by Joseph P. Davis, M. Am. Soc. C. E., of the office of City Engineer, Mr. Wightman was chosen to succeed him, and held the office till death. In this capacity he had charge of the construction and maintenance of most of the public works of the city, and attended to the multifarious and engrossing matters of business connected therewith. Among the more important works of which he had charge were included the completion of the Main Drainage Works begun under his predecessor; the completion of the works for bringing an additional supply of water from Sudbury River to the city; the construction of a new storage reservoir at Ashland; and grading, road-making, and bridging for the new public parks.

Mr. Wightman made an excursion to North Carolina in the spring of 1885, and came home suffering from pneumonia. The disease suddenly took an unfavorable turn a week later, when he died, April 3d, 1885, at his home in Boston.

Mr. Wightman's career was one of steady progress from the lowest to the highest place in the Boston City Engineer's Office. All his work was done thoroughly, though often under embarrassing circumstances occasioned by city politics. In such cases his business tact and knowledge of men, and of the best way of managing them, were very useful to the city. He accomplished the essential result of getting work well done, yet avoided wrangling and litigation. The reliance which was placed upon his judgment was shown by his being frequently employed as a referee in cases of controversy, and often consulted upon engineering questions outside the duties of his office. He had a natural constructive faculty by which he appeared to see instinctively whether a structure was well proportioned, and whether work was being well handled. Perhaps the leading and most instructive trait of his professional character was his executive ability. His decisions were definite, final and generally prompt; and when he entrusted authority to his subordinates he upheld them in its exercise. Where a man less fortunately constituted might have succumbed to overwork, he was saved by a happy faculty which kept him from worrying, and enabled him to stop thinking about his work when thinking about it could do no good. He was also favored by the possession of social qualities which made him an agreeable companion. He was of the greatest service to his parents and to his sisters.

Mr. Wightman was elected a member of the American Society of Civil Engineers April 2d, 1873; and he served as Chairman of the Local Committee when the Society held its Convention at Boston in 1878.

ADDITIONS TO

LIBRARY AND MUSEUM.

From W. F. Allen, Secretary General Time Convention, New York City:

Proceedings of the General Time Convention held at the Hotel Brunswick, New York City, October 13th and 14th, 1886.

From Allen Paper Car Wheel Company, New York City:

Description of the Allen Paper Car Wheel, with Plates.

From American Institute of Electrical Engineers, Ralph W. Pope, Secretary, New York City:

Transactions, Vol. III.

From American Institute of Mining Engineers, Dr. R. W. Raymond, Secretary, New York City:

The Geology and Vein Structure of Southwestern Colorado. Theo. B. Comstock.

Lode Locations. R. W. Raymond.

The Irregularities of the Blast-furnace Process, and a Practical Way to Avoid Them.

The Diamond Mines of South Africa. Gardner F. Williams.

The Attainment of Uniformity in the Bessemer Process. H. M. Howe.

The Ives Process of Photo-Mechanical Engraving, and its Usefulness to Engineers. R. W. Raymond.

Note on the Opening of a Chilled Hearth with Coal Oil Blow-pipe.

The Iron Ores and Coals of Alabama, Georgia and Tennessee.

Large Charges *vs.* Small Charges at Warwick Furnace.

Proceedings St. Louis Meeting.

The Dunnachie Continuous Regenerative Gas Kiln for Burning Fire brick, Pottery, etc. Thomas Egleston.

American Mining Schools. Prof. R. H. Richards.

An Improvement in Apparatus for the Manufacture of Sulphuric Acid. W. H. Adams.

Discussion of Mr. Walch's Paper on the Irregularities of the Blast Furnace. James E. Mills.

Titanium Carbide in Pig Iron. Porter W. Shimer

Tests of Manganese Steel. Joseph D. Weeks.

The Condition of Silver in a Sample of Litharge. Prof. Charles E. Wait.

Two Conditions of Phosphorus in Iron. Byron W. Cheever.

Sierra Mizada, Mexico. Richard E. Chism.

The Geological Map of the United States. C. H. Hitchcock.

The Genesis of Certain Ore Deposits. S. T. Emmons.

Comparisons of Blast Furnace Records. John Birkinbine.

Russell's Improved Process for the Lixiviation of Silver Ores in its Practical Application.

Geological Map of the United States and part of Canada.

From American Iron and Steel Association, Philadelphia, Pa.:

Directory to the Iron and Steel Works of the United States for 1886.

Twenty-one Years of Progress in the Manufacture of Iron and Steel in the United States. James M. Swank.

From M. D. Banderali, Paris, France:

Les Chemins de fer Métropolitains a New York and Dans les Grandes Cités Américains.

From Carrol Ph. Bassett, Newark, N. J.:

Contract for Sewers and Appurtenances, East Orange, N. J.

From Edwin F. Bedell, New York City:

Framed Photographs of Draw-bridge over the Harlem River at Second Avenue, New York.

From E. S. Bellasis, London, England:

A Paper on the Roorkee Hydraulic Experiments, with an Abstract of the Same. E. S. Bellasis, Assoc. M. Inst. C. E.

From H. Bissell, Salem, Mass.:

Fifty-third Annual Report of the Boston and Maine Railroad for the Year ending September 30th, 1886.

From D. E. Bishop, New York City:

Field Notes, etc., of the third railroad built in the United States in 1829. Ithaca and Oswego Railroad.

From C. R. Boyd, Wytheville, Va.:

Map of Southwest Virginia and Contiguous Territory.

Mineral Resources and Railway Facilities.

From Bureau of Education, Washington, D. C.:

Special Report by the Bureau of Education and Educational Exhibits and Conventions at the World's Industrial and Cotton Centennial Exposition, New Orleans, 1884-85, Part I.

From Bureau of Navigation, Navy Department, Washington, D. C.:

Pilot Chart of the North Atlantic Ocean for September, October, November and December, 1886.

From H. W. Brinckherhoff, Brooklyn, N. Y.:

Plans and Sections of the Obelisk on Bunker Hill, with the Details of Experiments made in Quarrying the Granite.

From B. S. Church, New York City:

Reports of Examining Engineers on the charges preferred against the Chief Engineer of the Aqueduct Commission (Copies for distribution.)

From Eliot C. Clarke, Boston, Mass:

Prevention of Floods in the Valley of Stone Brook.

From Chief of Engineers U. S. A., Washington. D. C.:

Advertisements, Instructions, Specifications and Proposals as follows:

For Furnishing Timber, Plank or Edgings at Carrolton Bar, Saginaw River, Mich.

For Improvement of Chickahominy River, Va.
For Improvement of York River, Va.
For Improvement of Potomac River near Washington, D. C.
For Improvement of Potomac River near Washington, D. C., Tidal Reservoir.
For Improvement of Inland Navigation from New Berne to Beaufort Harbor *via* Clubfort, Harlowe and Newport Rivers, N. C.
For Improving Calcasieu River and Pass, La.
For Improving Tchefuncte River, La.
For Removing Ledge from the Cochew River, N. H.
Improving Susquehanna River, Md., above the Baltimore and Philadelphia Railroad Bridge.
Extending the Pile Dike at the Mouth of the Passaic River, N. J.
Improvement of Santee River, S. C., and its outlet through Mosquito Creek.
Improvement of New River, N. C.
For Constructing Dike between Hog and Maiden Islands, Delaware River.
Improvement of Potomac River near Washton, D. C., Washington Channel.
Dredging Saginaw River, Mich.
Dredging West of Petty's Island, Delaware River.
Furnishing and Placing Stone in revetment across Smith's Island Bar.
Improvement of Schuylkill River, Pa.
Dredging at Smith's Island Bar between Philadelphia and Camden, Delaware River.
Dredging in James River, Va.
For Furnishing Piles and Pile-Driving; Furnishing Timber, Plank and Edging, and Iron Bolts, Spikes and Nails for Repairs of Beam Wall and Revetment at Carrollton Bar, Saginaw River, Mich.
For Dredging Norfolk Harbor, Va., and approach to same.
Improvement of San Joaquin River, Stockton and Mormon Sloughs, Cal.
For Dredging and Rock Excavation; Construction of Mattress-Dikes; and Construction and Extension of Jetties.
For Furnishing Lumber for Bulkhead Piers and Coffer-Dams at Saint Mary's Falls Canal, Mich.
For Furnishing and Placing Puddling Clay for a Coffer-Dam at Saint Mary's Falls Canal, Mich.
For Furnishing Iron Draft Bolts and Spikes at Saint Mary's Falls Canal, Mich.
For Furnishing One Dredge, One Tug and Two Dump Scows for use at Saint Mary's River and Saint Mary's Falls Canal, Mich.
For Framing, Placing, Filling and Completing Crib-piers for Bulkheads and Coffer-Dam at Saint Mary's Falls Canal, Mich.
For South Pier Extension, Calumet Harbor, Ill.
For Removing Rock in Portsmouth Harbor, N. H.
Improving Harbor at Georgetown, S. C.
Improvement of Wilmington Harbor, Cal.
Dredging at Ogdensburg Harbor, N. J.
For Stone for Breakwater, Saco River, Me.
Improving Harbor at Wilmington, Del.
Improvement of Inland Waterway between Beaufort Harbor and New River, N. C., through Bergen Sound.
Improving Cape Fear River, N. C., below Wilmington.
Construction of Breakwater at Rouse's Point, Lake Champlain, N. Y.
Dredging at Kenyon's Bay and Rock Excavation at Elbow, near Whitehall, N. Y.
Ohio River Improvement. Davis Island Dam.
For Furnishing Material and Doing the Work of Repairs to Gilbert's Island Dam, Denmark Island Dam, Cincinnati Landing Chute, Wing Dams and other Shore Protections.
For Furnishing and Delivering Brush Harbor at New Orleans, La.
Improvement of Breton Bay, Md.
Improvement of Potomac River near Washington, D. C. Rip-rap Stone.
Improvement of Volusia Bar, Fla.
Improving Channel Over the Bar at the Mouth of St John's River, Fla.
Harbor Improvement Saint Joseph, Mich.
For Constructing Wharves in the Harbor of Refuge at Woods Hole, Mass.
Improvement of Harbor at Savannah, Ga.
Improving Harbor at Norfolk, Va., Approach to Norfolk Harbor and the U. S. (Norfolk) Navy Yard, Va., Currituck Sound, N. C., and North River Bar, N. C.
For Superstructure and Repairs of Pier Kenosha Harbor, Wis.
For Improvement of Brunswick Harbor, Ga.
For Improvement of Savannah Harbor and River, Ga.
For Improvement of Harbor at Charleston, S. C.
For Improvement of Brunswick Harbor, Ga.
For Construction of Breakwater, Harbor of Refuge, Milwaukee Bay, Wis.
For Superstructure and Repairs of Pier, Racine Harbor, Wis.
For Superstructure and Repairs of Pier, Milwaukee Harbor, Wis.
For Improvement of Mobile Harbor, Ala.
For Improvement of Michigan City, Indiana, Outer Harbor.
For Improving Channel Leading to Harbor at Baltimore.
For Dredging in Wareham Harbor, Mass.
For Dredging in Newport Harbor, R. I.
For Improvement of Cumberland Sound, Ga. and Fla.
For Improving Appomattox River, Va.
For Removing Ledge of Solid Rock and Boulders from Detroit River.
For Furnishing Rope, Boat, Supplies, etc., for Great Kanawha River Improvement.
For Removal of the Wreck of the Schooner "B." Oliphant, in Chesapeake Bay.
For Completing No. 6 Lock House, Great Kanawha River Improvement.
For Building the Dam and Abutment at Lock No. 2, Great Kanawha River, W. Va.
For Furnishing Timber and Plank and Iron Plates, Bolts and Spikes, for Repairing Crib-Work at the Harbor of Refuge at Sand Beach, Mich.
For Furnishing Piles at Government Works in the Mississippi River, between St Louis and Harrisonville.
For Furnishing Screw-Bolts at the United States Engineer Depot, foot of Arsenal Street, in St. Louis, Mo.
For Furnishing Spikes, Iron and Nails at the United States Engineer Depot, foot of Arsenal Street, in St. Louis, Mo.
For Furnishing Manila Rope at the United States Engineer Depot, foot of Arsenal Street, in St. Louis, Mo.

For Excavating at Middle Neebish, Hay Lake Channel, Mich.
For Dredging in Flushing Bay, N. Y.
For Dredging in New London Harbor, Conn.
For Increasing Height of East Jetty at Saybrook, Conn.
For Extending the New Haven Breakwater.
For Dredging in Bridgeport Harbor, Conn.
For Extending the Dike in New Haven Harbor, Conn.
For Dredging in Black Rock Harbor, Conn.
For Dredging in Norwalk River, Conn.
For Dredging in Hyannis Harbor, Mass.; Pawtucket River, R. I.; Providence River, R. I.; Pawcatuck River, R. I. and Conn.; and the Removal of Green Jacket Shoal, Providence Harbor, R. I.
For Dredging in Lynn Harbor, Mass.
For Dredging and Blasting in Cituate Harbor, Mass.
For Dredging in Plymouth Harbor, Mass.
For Dredging in Ipswich River, Mass.
For Improving Harbor at Sabine Pass, Texas.
For Improving Hingham Harbor, Mass.
For Improving Oakland Harbor, Cal.
For Improving Harbor at Kewaunee, Wis.
For Improving Harbor at Port Washington, Wis.
For Improving Harbor at Manitowoc, Wis.
For Improving Harbor at Sheboygan, Wis.
For Improving Harbor at Grand Marais, Mich.
For Improving Harbor at Ontonagon, Mich.
For Rubble Stone for the Extension of North Jetty at Entrance to Newburyport Harbor, Mass
For Rubble Stone for Harbor of Refuge, Sandy Bay, Cape Ann, Mass.
For Increasing Height of Dike in the Connecticut River at Hartford, Conn.
For Constructing a Dike in the Thames River, Conn.
For Improving Potomac River near Washington, D. C., Dredging and Embankment.
For Rip-rap Stone for Potomac River near Washington, D. C.
For Dredging North River Bar, N. C.
For Proposed Wharf at Cascade Locks, Ore.
For Improving Choptank River, Md.
For Improving Corsica Creek, Md.
For Furnishing Rip-rap Granite for the Eastern Jetty at Nantucket, Mass., and the Eastern Breakwater at Stonington, Conn.
For Furnishing Stone for Use at the Des Moines Rapid Canal and Dry Dock.
For Extending the Breakwater at Greenport, N. Y.
For Removing Broken Rock from Middle Reef, or Flood Rock, Hell Gate, N. Y.
For Building Cribs and Rip-rapping Susquehanna River, Md.
For Removing Theiss Rock and Jetty Housatonic River, Conn.
For Engineer Supplies and Repair of Boat at Nantucket, Mass.
' or Decked Flat-boat.
For Fuel.
Removal of Wreck at Cape Henlopen, Del.
Furnishing and Placing Stone in the Gap, Delaware Breakwater.
Instructions to Bidders.
Bridge over the Ohio River at or near Cairo, Ill.
A Statement Relative to the Kentucky and Indiana Bridge Company.
To the Utility of a Breakwater at Gordon's Landing, Lake Champlain.
Reports Relative to Filters for the Water Supply for the Capitol.

From William A. Crafts, Boston, Mass.:
Seventeenth Annual Report of the Board of Railroad Commissioners of Massachusetts, January, 1886.

From Joseph P. Davis, New York City:
Journal of the Franklin Institute. Vol. XLI, 1861, to Vol. XC, 1885, bound. January to August, 1885, unbound.
Plates to Illustrate Macaulay's Treatise on Field Fortification, and other subjects connected with Field Engineering.
A Hand-book for Plain and Ornamental Mapping and Engineering Drawing.
Long and Short Span Railway Bridges, John A Roebling.
Designs for Tall Chimney Shafts. R. Rawlinson.
American Bell Telephone Company *vs.* Overland Telephone Company of New York. Defendant's Answer and Proof on Motion for Injunction,
The American Bell Telephone Company and Others *vs.* The People's Telephone Company and Others. Defendant's Sur-Rebutting Testimony.
Brief for Complainants on Final Hearing.
Arguments of Hon. Lysander Hill and Hon. George F. Edmunds, for the Defendants.
Opinion of Hon. Don A. Pardee and Hon. Edward C. Billings, granting Complainant's Motion.
Abstract of Testimony.
A Sketch of a Physical Description of the Universe. Volumes I, II, III, IV and V. Alexander Von Humboldt.
Report on the Explosions of Steam Boilers. Part II.
Annual of Scientific Discoveries for 1869 and 1870.

Protection against Fire and the Best Means of Putting out Fires in Cities, Towns and Villages.
The Art of Brewing Ale, Beer and Porter.
A Treatise on the Construction and Management of Railways.
Rifle and Light Infantry Tactics. Volumes I and II.
The Contractors' Manual and Builders' Price Book.
A Treatise on Field Fortifications.
The Slide Valve Practically Considered.
Steel Engraving of Gate-house at Farm Pond, Boston Water-works. Sudbury River Conduits.
Plans of Hydrants and Stop-cocks.
Plans, Profiles, for Crossing of New Croton Aqueduct under the Harlem River.
Sixteen Maps of the Peruvian Guano Islands. Surveyed by Joseph P. Davis, M. Am. Soc. C. E.
General Specifications for Pumping Engines to Govern Designs Accompanying Proposals.

From G. F. Deacon, Liverpool, England;
Annual Report of the Engineer as to the Progress of the Works of the City of Liverpool Corporation Water-works.
Second Report of the Special Sub-Committee of the Water Committee on the Proposed Supply of Water frem the River Vyrnwy.
Report of the Special Committee on the New Water Supply.

From J. H. Decker, Secretary American Water-works Association, Hannibal, Mo.:

Report of Proceedings of the Sixth Annual Meeting of the American Water-works Association, held at Denver, Colo., June 23, 24 and 25, 1886.

From Dr. Daniel Draper, Director New York Meteorological Observatory, Central Park, New York City:

Memoir of John William Draper, 1811-1882.

From Edward Bates Dorsey, New York City:

Colorado: its Gold and Silver Mines, Farm and Stock Ranges, and Health and Pleasnre Resorts.

Annual Report upon the Geographical Surveys of the Territory of the United States, West of the 100th Meridian.

Report on Bridging the Missisippi River between St. Paul, Minn., and St. Louis, Mo.

The Bartholdi Statue: History and Description.

Annual Reports of the Philadelphia, Wilmington and Baltimore Railroad Company for the Years 1883 to 1885, inclusive.

Twenty-third Annual Report of the Directors of the old Colony Railroad Company, November 23, 1886.

Fourteeth Annual Report of the Atchinson, Topeka and Santa Fé Railroad Company for the year ending December 31, 1885.

From H. A. Duc., Jr., Charleston, S. C.:

Ten Photographs taken after the Earthquake, and Samples of Sand as follows:

Earthquake Ruins of Mr. August Melin's Room, 21 King street, Charleston, S. C.

Fissure at the Ten Mile Hill.

Cumberland and East Bay Street.

Hibernian Hall.

Hole on St. Phillip and Green Street.

Track out of Line.

Hayne Street.

Old Hospital.

Two Photographs of Fissures.

Precipitated Matter from the Water which flowed from Fissures at the Ten Mile Hill.

Sample of Rice from the vicinity of the Fissures near Ten Mile Hill.

Shell Lime from the Chimney of an Old House over 100 years old on the lot of H. A. Duc, Jr.,

Samples of Sand from the Earthquake Fissure at Ten Mile Hill near Charleston, S. C. (12 different samples).

Sample of Shell Lime from the old Chimney Duc's House.

Ruins of Hibernian Hall.

From St. Michael's Church.

Sample of Micaceous Sand Extracted from a Fissure on the top of Ten Mile Hill, near Charleston (No. 1).

Sample of Sand lying on the top of No. 1 from same Fissure (No. 2).

Sample of Sand covering Nos. 1 and 2 from same Fissure (No. 3).

Samples of Undisturbed Soil adjacent to the Fissures from which samples Nos. 1, 2 and were obtained.

Samples of Strata at the bottom of New Artesian Well, 920 feet deep. Well was not disturbed by the Earthquake.

From Dyckerhoff, Sohne, Amoenburg, Germany:

Protokoll der Verhandlungen des Vereins Deutscher Cement Fabrikanter und der Section für Cement des Deutschen Vereins Fabrikateon von Zigeln.

Thomvaaren Kalk und Cement 1880 and 1885, and Journal für Gaslebenchtung und Wasserversorgung 1886.

From Thomas Evershed, Rochester, N. Y.:

Water Power at Niagara Falls to be Successfully Utilized.

From M. N. Forney, New York City:

Photograph of Steam Tug New Jersey, with Description.

From E. B. Freeman, Norfolk, Va.:

The Preservation of Timber: or How to Prevent Decay and Preserve Timber against the Attack of the *Toredo Navalis* or Ship worm.

From E. A. Fuertes, Ithaca, N. Y.:

Cayuga Lake, N. Y., Surveyed by the Engineer Department, Cornell University.

From S. M. Gray, Providence, R. I:

Report Showing Location and Size of the Main and Intercepting Sewers of Providence, R. I.

From G, S. Greene, Jr., New York City:

Sixteenth Annual Report and Minutes of the Department of Docks for the Year ending April 30th, 1886; also Anuual Report of Docks for 1886 and Minutes of the Board.

From J. M. Goodwin, Sharpsville, Pa.:

Reports of the Engineers of the Western Railroad Corporation made to the Directors in 1836-37.

Annual Report of the Michigan Southern and Northern Indiana Railroad Company, March 1st, 1886.

A Letter to the Honorable Brockholst Livingston on the Lake Canal Policy of the State of New York, with a Supplement and Additional Documents.

Report of Board Convened to Determine on a Standard for Construction of Pacific Railroad, made to Hon. James Harlan, Secretary of the Interior, February 24th, 1866, with Accompanying Documents.

Address of John W. Garrett, President, made on the 12th of February, 1868, at the Monthly Meeting of the Board of Directors of the Baltimore and Ohio Railroad Company.

From William Ham Hall, Sacramento, Cal.:

Irrigation Report of the State Engineer of California.

Irrigation Laws and Regulations in France, Italy and Spain.

Memorandum of the Irrigation Question.

From Wm. Hamilton, Toronto, Canada:

Annual Report of the City Engineer and Manager of the Toronto Water-works for the year ending 31st December, 1884.

From Institution of Civil Engineers, James Forrest, Secretary, London:

The Separation of Galena and Blende. Ernest Du Bois Lukis.

Footpaths. Henry Percy Boulnois.

On the Effects of Liquids on Iron. David Phillips.

The Maintenance of the Belah and Deepdale Viaducts on the North Eastern Railway. William John Cudworth.
Coefficients of Discharge Applicable to Certain Submerged Weirs of Large Dimensions. Robert Hunter Rhind.
The Stability of Voussoir Arches, Henry Albert Cutler.
Description of a Circular Chimney Shaft at Merchernich, near Cologne. John Mackworth Wood.
The Design and Stability of Masonry Dams. Walter Bulkeley Coventry.
The Mersey Railway. Francis Fox.
The Hydraulic Passenger Lifts at the Underground Station of the Mersey Railway. William Edmund Rich. (With an abstract of the discussion upon the paper.)
Brick-making. Henry Ward. (With an abstract of the discussion upon the paper.)
Modern Machine Tools and Workshop Appliances for the Treatment of Heavy Forgings and Castings. William Wilson Hulse. (With an abstract of the discussion upon the paper.)
Experiments on the Relative Strength of Cast-Iron Beams. Edward Carstensen De Segundo and Leslie Stephen Robinson.
On the Horizontal Range of Tidal Rivers, such as the river or well with reference to Sewage Discharge. Charles Foote Gower.
Experiments on a Direct Acting Steam-Pump. John George Mair.
Viaduct over the River Esk at Whitby, and the Embankments and Culverts in the Raimes. Francis Fox
On the Practical Strength of Columns and of Braced Struts. Thomas Claxton Fidler.
Heliography; or, the Actinic Copying of Engineering Drawings. Benjamin Howarth Thwaite.
The Bilbao Iron-works. Neil Kennedy.
The Gold Fields of South Africa. Sidney Howard Farrar.
Minutes of Proceedings. Vol. LXXXVI, 1885–86, Part 4.
Brief Subject Index Vols. LIX to LXXXVI.

From Institute of Engineers and Shipbuilders in Scotland. W. J. Millar, Secretary, Glasgow, Scotland:
Transactions, Vol. XXIX, 1885–86.

From Iron and Steel Institution, J S. Jeans, Secretary, London, England:
The Journal of the Iron and Steel Institution, No. 1, 1886.

From Dr. J. P. Janse, Schereningen, Holland:
Procés-Verbaux des Seances du Congrès International de Navigatiou Intérieure tenue à Bruxelles, du 24 Mai au 2 Juin, 1885.
Memoires publiés à l'occasion du Congrès International de Navigation Interieure terne à Bruxelles, du 24 Mai an 2 Juin, 1885.
Examen des Travaux de la Commission des Canaux Brabancons por Jaues de Blois.
Map of the Manchester Ship Canal, with a Description of the Plans Prepared for the Session 1885.
Bulletin du Canal Interoceanique, August 1, 1886.

From J. C. Kelton. Asst Adjutant-General, U. S. A., Washington, D. C.:
Official Army Register for 1886.

From Marvin W. Kingsley, Cleveland, Ohio:
Thirteenth Annual Report of the Waterworks Trustees of the City of Cleveland, Ohio, for the year ending December 31, 1885.

From Charles Kilner Sheard, Tasmania:
Descriptive Paper of Railway Practice and Mountain Railways of a Similar Description to the Tasmanian Railways now under Construction.

From Konigliche Kommission, Berlin, Germany:
Mittheiungenaus den Koniglichen technischen der fuchsauftalten zu Berlin. Vols. I, II, III, IV, 1885, and Vols. I, II and III of 1886.

From J. Francis Le Baron, Jacksonville. Fla.:
The Desirability of the Establishment by the States of a True Polar Meridian and Standard of Length in each County.

From James MacNaughton, Albany, N. Y.:
The Expedition of the Alert to Hudson's Strait and Bay in 1885.

From Capt. O. E. Michaelis, West Troy, N. Y.:
Report of the Electrical Conference at Philadelphia in September, 1884.

From Robert Moore, St. Louis, Mo.:
Kutter's Formula and its Application to Circular Sewers.

From George S. Morison, New York City:
Vol. XX of the Tenth Census of the United States, 1880.

From Gilbert Murdoch, St. John, N. B., Canada:
Annual Accounts and Statements with Superintendent's and Auditor's Reports, of the Sewerage and Water Supply for the City of St. John (East Side), and Town of Portland for the year ending December 31, 1885.

From Robert Murray, Surgeon-General U. S. A., Washington, D. C :
Index Catalogue of the Library of the Surgeon-General's Office, United States Army. Vol. VII.

From Navy Department, Washington, D. C.:
Report on European Dock-yards. Philip Hickborn.

From New York Meteorological Observatory, Dr. Daniel Draper, Director, Central Park, New York City:
Abstract of Registers for Self-Recording Instruments for July, August, September, October, 1886.

From Professor Simon Newcomb, U. S. N., Superintendent American Ephemeris and Nautical Almanac, Washington:
The American Ephemeris and Nautical Almanac for the Year 1889.

From New York State Board of Health, Albany, N. Y.;
Bulletin of the State Board of Health for July, August, September and October, 1886.

From Joseph Nimmo, Jr.. Huntington N. Y.:

Sea-coast Defenses of New York City, Long Island, Staten Island and Connecticut.

From Edward P. North, New York City:

Fifth Annual Report of the Chicago, St, Paul, Minneapolis and Omaha Railway Company for the Year ending December 31st, 1885.

Annual Report of the Chicago and Northwestern Railway Company for the Twenty-seventh Fiscal Year, ending May 31st, 1886.

Second Annual Report of the Supervisory Board of Commissioners of the New York Municipal Civil Service.

From John L. Ogden, Philadelphia, Pa.:

Eighty-fourth Annual Report of the Chief Engineer of the Philadelphia Water Department for the Year 1885.

From Ordnance Department, General S. V. Benet, Chief, Washington, D. C.:

Ordnance Notes, Vol. XII.

Index to Ordnance Notes, Nos. 344 to 357 inclusive.

From Charles Paine, Pittsburgh, Pa.:

Something about Natural Gas: Its Origin, Extent and Development.

From H. V. & H. W. Poor, New York City:

Poor's Directory of Railway Officials and Railway Directors for 1886.

From Ernest Pontzen, Paris, France:

Studie Uber Die Wiener Stadtlahuen mit beziehung auf dei Entrichlung der Staat Wier.

From J. W. Powell, Director U. S. Geological Survey, Washington, D. C.:

Mineral Products of the United States Calendar-Year 1882-83-84 and 85.

From George W. Rafter, Rochester, N. Y.:

On the Use of the Microscope in Determining the Sanitary Value of Potable Water, with Special Reference to the Biology of the Water of Hemlock Lake.

From J. H. Setchel, Secretary American Railway Master Mechanics' Association, Dunkirk, N. Y.:

Report of Procedings of Seventeenth and Eighteenth Annual Conventions of the American Railway Master Mechanics' Association, 1884-85.

The First, Second, Third, Seventh, Eighth, Tenth, Eleventh, Twelfth, Thirteenth, Fourteenth, Fifteenth and Sixteenth Reports of Proceedings of the American Railway Master Mechanics' Association.

From Hamilton Smith, Jr., London, England:

Costs of Mining and Milling "Tin" Gold Ores.

From Oberlin Smith, Bridgeton, N. J.:

Flow of Metals in the Drawing Process.

From Smithsonian Institution, Washington, D. C.:

Annual Report of the Board of Regents of the Smithsonian Institution for the Year 1884.

From Societe pour la Defense des Interests de la Valee de la Seine, Rouen, France:

Memoire sur les Ameeliorations et Apporter ad Port du Havre it dans L'estuaire de la Seine.

From A. W. Stedman, Chief Engineer Lehigh Valley Railroad, Mauch Chunk, Pa.:

A framed picture showing sections of the Vosburg Tunnel, as constructed on the line of the Lehigh Valley Railroad.

From F. P. Stearns, Boston, Mass.:

Seventh Annual Report of the State Board of Health, Lunacy and Charity of Massachusetts. 1886.

From Simon Stevens, New York City:

How Steam May be Used on Canals. Letter of Simon Stevens, President Tehuantepec Railway Company, to the Canal Board of the State of New York, August 31st, 1872.

From Waterman Stone, Providence, R. I.:

Annual Report of the Commissioner of Dams and Reservoirs for the Years from 1883 to 1886, inclusive.

From Superintendent of the Library and War Records, Navy Department, Washington, D. C.:

Regulations Governing the Uniform of Commissioned Officers, Warrant Officers and Enlisted Men of the Navy of the United States, with Plates for 1886.

From Russell Thayer, Philadelphia, Pa.:

A Scientific Investigation of the Method of Action of Earthquakes and a Theory of their Primary Cause.

From J. Nelson Tubbs, Rochester. N. Y.:

Tenth Annual Report of the Executive Board of the City of Rochester, N. Y.

From the Under Secretary of State for India, India Office, London, England.

Notes on the Jumna Canal. E. T. Atkinson.

Notes on the Ganges Canal. E. T. Atkinson.

Notes on the Lower Ganges Canal. E. T. Atkinson.

Report on Remodeling the Ganges Canal, with Plans and Report of Committee. Captain Crofton.

Report on the Sardah Canal Project.

Report on the Irrigation, etc., of the Rajahmundry District. Major Cotton. 1850.

Western Jumna and Doub Canals Irrigation Works. 1851.

Copies or Extracts of Documents Referring to the Works of Irrigation of the Godavery River and Kistnah Annicuts in the Presidency of Madras. 1852.

Effects of Godavery and Kistnah Annicuts, etc. Session 1859.

Report by Colonel Colton on Canal Works, etc.

Godavery River. Letters by Captain Haig, 1850.

Correspondence with India, Madras and Bombay, with Reports on Irrigation Works, Financial Results and Management. 1870.

Report of Select Committee on East India Public Works. 1878.

Index to the Report from the Select Committee on East India Public Works. 1878.

Report of Select Committee on East India Public Works. 1878-79.

Index to the Report from the Select Committee on East India Public Works. 1878-79.

Report of Famine Commission, Appendix V. Irrigation as a protection against Famine. 1881.

Resolution by the Honorable The Lieutenant-Governor of the Northwestern Provinces on the Report of the Ganges Canal Committee.

Report of the Ganges Canal Committee.

From United States Geological Survey, Washington, D. C.:
Bulletins of the United States Geological Survey, Nos. 27, 28 and 29.
Twenty Atlas Sheets United States Geological Survey.

From Robert Van Buren, Brooklyn, N. Y.:
Annual Report of the Department of City Works of the City of Brooklyn, for the year 1885.

From D. Van Nostrand, New York City:
The Separate System of Sewerage; its Theory and Construction.

From United States Navy Department, Washington, D. C.:
Annual Report of the Secretary of the Navy for the year 1886.

From Lieutenant A.W. Vogdes, U. S. A., New York City:
Description of a New Crustacean from the Clinton Group of Georgia, with remarks upon others.

From Leo Von Rosenberg, New York City:
Map showing the Mackay-Bennett Cables in the Vicinity of the Principal Fishing Grounds.

From A. M. Wellington, New York City:
Map of the preliminary located line of the Mountain Grade from Rinconada to Las Vigas in Mexico.
Map of the same showing contour lines, profile of first mile and of the preliminary located line on the upper Mountain Grade from Jalapa to Las Vigas.
Profile of the whole line.
Map of the Mexican National Railway.

From John Whitelaw, Cleveland, Ohio:
Thirteenth Annual Report of the Water-works Trustees of the City of Cleveland, Ohio, for the year ending December 31st, 1885 Parts I and II.

From other sources:
Advertisements, specifications and proposals, as follows:
For Laying Submerged Iron Sewer Pipe.
For Building Retaining Walls for Main Sewer Outlet at foot of Marsh street, Newport, R. I.
For Furnishing Iron Sewer Pipes.
Report of Hon. W. J. McAlpine and Kivas Tully, Civil Engineer, on a System of Intercepting and Outfall Sewers for the City of Toronto.
Goulard-Gibbs System of Electrical Distribution.
Resolutions of the American Shipping Convention held at Pensacola, Fla., November 1st, 1886.
On a Proposal for an American Academy of Engineering. William E. Kent.
Irrigation. Development, History, Customs, Laws and Administrative Systems relating to Irrigation, Water-courses and Waters in France, Italy and Spain. Wm. Ham Hall.
An Appeal in behalf of the Navy and its *personnel*, with notes of some incidents in its history.
Argument of Nathaniel C. Moak on the resolution to inquire as to article written by George F. Spinney for *New York Times* of April 5th, 1886, on Senator Raines, charging an effort to steal the Staten Island water front for the Baltimore and Ohio Railroad.
Official Guide to the International Health Exhibition.
Argument of Nathaniel C. Moak before the Senate Committee on Privileges and Elections, May 10th, 1883.
Plans and Proposals for the Metropolitan Water Company of the City of New York.
Report of the Sewer Committee of the City of Schenectady, including the Ordinance and Specifications regulating their use.
Memoir sur les Ameliorations et Apporter un Port du Havre et dans l'estuaire de la Seine.
Official Guide to the International Invention Exhibition, London, England.

LIST OF MEMBERS.

ADDITIONS.

MEMBERS.	Date of Election.
BRINCKERHOFF, ALEXANDER GORDON.....(Care Bates & Johnson) 114 Leonard st., New York City...	Nov. 3, 1886.
BUTTERFIELD, FRANCIS EAVE....Chief Engineer Mexican Guadalupe R. R., Villadama, Nuevo Leon, Mexico.....	Sept. 1, 1886.

ASSOCIATE. Date of Election.

HASKINS, WILLIAM JEWETT. ....(Elected Junior March 7th, 1883.) Assistant Engineer Departm't Public Works, 537 West 105th st., New York City. .....Dec. 1, 1886.

MORRIS, THOMAS O'NEIL. .....Engineer Maintenance Way Cincinnati, Indianapolis, St. Louis and Chicago Ry., Indianapolis, Ind.....Oct. 6, 1886.

RICHARDS, HUGH TUDOR. .....Resident Engineer Sonora R. R., Guaymas, Mexico.....Oct. 6, 1886.

WARD, JOHN FROTHINGHAM. .....Consulting Engineer, 18 Broadway, New York City.....Oct. 6, 1886.

WETHERILL, WILLIAM CHATLIN. Liberty, Mo. .....Dec. 1, 1886.

JUNIOR.

MODJESKI, RALPH.....Assistant Engineer Omaha Bridge, Omaha, Neb.....Dec. 1, 1886.

CHANGES AND CORRECTIONS.

MEMBERS.

ALLEN, C. FRANK .....Las Vegas, N. M.

ANDERSON, ADNA ....Second Vice-President and Engineer-in-Chief Northern Pacific R. R., Tacoma, Wash.

APPLETON, ELLERY C ....Resident Engineer Chicago, Kansas and Nebraska Ry., Marion, Kan.

BARNARD, AUGUSTUS P.....28 West 20th st., New York City.

BLICKENSDERFER, JACOB .....Consulting Engineer Union Pacific Ry., Omaha, Neb.

BOGUE, VIRGIL G .....Chief Engineer Union Pacific Ry., Omaha, Neb.

BONZANO, MAXIMILIAN F.....Superintendent North Penn. and Bound Brook Division Philadelphia and Reading R. R., 9th and Green sts., Philadelphia, Pa.

CALKINS, FRANK A. .....55 Ross st., Brooklyn, N. Y.

CRAIG, CHAMBERS M. .....Alabama Midland R. R., Sneads, Fla.

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POST, JAMES C..... ....Major Corps of Engineers U. S. A., Cincinnati, Ohio.
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SNOW, J. PARKER .....Orlando, Fla.
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WALLACE, JOHN F. .....Keithsburg, Ill.
WEEKS, HARVEY R. .....Resident Engineer Chicago, Santa Fé and California Ry., Kahoma, Mo.
WELLINGTON, ARTHUR M. .....Editor *Engineering News*, Tribune Building, New York City.

ASSOCIATE.

HARRIS, CHARLES M.....White Plains, N. Y.

JUNIORS.

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SHEPARD, WILLIAM T.....Bristol, Conn.
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RESIGNATIONS.

BISHOP, JUDSON W. .....Dec. 31, 1886.
CASEY, THOMAS L.....Dec. 31, 1886.
NICHOLS, AURIN B. .....Dec. 31, 1886.
TRAFTON, GILMAN .....Dec. 31, 1886.
WOOD, DE VOLSON. .....Dec. 31, 1886.

DEATHS.

DIRKS, JUSTUS.....Elected Honorary Member June 2, 1880; died December 26, 1886.
SMITH, C. SHALER.....Elected Member March 5, 1873; died December 19, 1886.